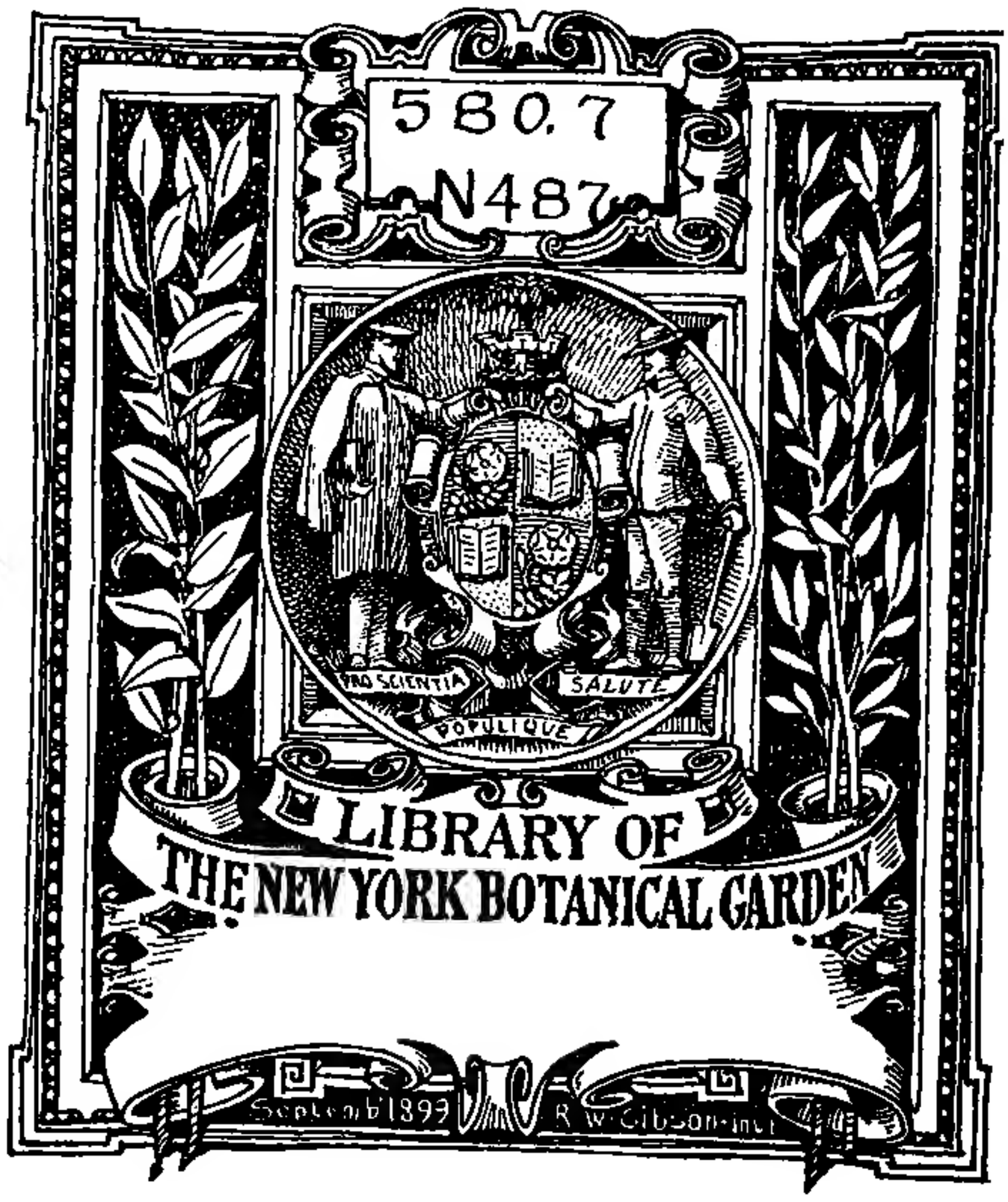
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# OF

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# The New York Botanical Garden

EDITOR

HENRY ALLAN GLEASON

*Assistant Director*


VOLUME XXI

WITH 12 PLATES

1920

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# THE AIMS AND METHODS OF PLANT BREEDING

During the past three decades much attention has been paid to experimental studies bearing on heredity, variation, and evolution. Departments of plant and animal breeding (or "genetics") have been developed in many institutions with the aim of determining fundamental principles. In agricultural experiment stations especially, a very general effort has been made to apply methods and doctrines in securing practical results. Commercial concerns have paid much attention to the development of experimental plots and testing grounds in which new varieties are produced for the farm, the orchard, and the flower and vegetable garden. Special attention has also been directed to the application of theories of heredity to human affairs through what is now called the science of "eugenics." Several popular and technical journals are devoted wholly or in part to the publication of articles bearing on genetics and eugenics, and books on various aspects of these subjects are now numerous. Thus the results of practical and theoretical interests have become rather widely disseminated, and very generally read and discussed.

The advance of knowledge in several lines of popular and scientific interest has contributed to the present-day development of genetics. Especially is this true of the art of plant breeding and the important place that experimental work with plants has taken in studies of heredity.

Considered in its broad sense, plant breeding through the selection of seed-parents is as old as the art of agriculture. The

development of many, if not all, of our most important economic plants was clearly not merely a matter of bringing wild forms under cultivation. Many races of plants especially adapted to the needs of man had been produced by selection before the days of written history. Many species of cultivated plants have become so changed during the period of cultivation that their ancestry is not known with certainty.

In the more modern sense, plant breeding has come to mean the maintenance of types and the production of new types through direction and control of the natural processes of self- and cross-fertilization. The methods of plant breeding are hence based on a knowledge of sexuality in plants. It was the discovery of sex in plants and the development of methods of controlling its operation that laid the basis of modern plant breeding.

This discovery was made more or less independently by several investigators. An English botanist, Nehemiah Grew, in a lecture before the Royal Society in 1676, very clearly states the fact of sex in plants and credits Sir Thomas Millington with determining the point. To what extent the observations involved definite experiments is not recorded. The credit of first clearly demonstrating sex in plants by experiment is very generally given to the German botanist Camerarius. The account of his experiments and conclusions was recorded in the form of a letter written in 1694 and first published that same year and again in 1696 in volumes that are evidently among the rarest of botanical publications. The letter was again printed in 1749 as a part of a small volume in which it seems to have received wider distribution. More recently (1899) it was translated into German and printed, in which form it is most available today. About the year 1737 an American, James Logan, then Governor of Pennsylvania, made some carefully planned experiments which demonstrated sex in Indian corn. Logan was evidently unaware of any previous observations on this point except those of Sir Thomas Millington.

In the year 1718 it was recorded that Thomas Fairchild had already produced by experimental methods a hybrid between

the Sweet William and the Carnation. Evidently this is the first hybrid of which there is definite record thus produced between two distinct species. Mention of this hybrid is made by Richard Bradley, later a professor of Botany at Cambridge University, England, in his book "New Improvements of Planting and Gardening." The first edition of this volume was published in 1717 and at least six other editions followed within twenty-two years thereafter. In the second edition published in 1718 (the earliest that the writer has thus far seen), under the topic "Generation of plants," the facts of sex in plants are well stated. Here one Robert Balle is cited as having been well acquainted with such facts for "above thirty years." The general functions of the parts of the flowers in seed production are well described, and experiments proving the points are mentioned. Furthermore numerous cases of variation among a seed progeny are attributed to cross-fertilization between different varieties. The desirability of selecting seed parents from best plants that are kept in isolation from poorer sorts is also emphasized.

Gradually the facts regarding sexuality in plants became more generally known to those interested in plants and in plant breeding and accordingly influenced the course of experimental work. The hundred years between 1760 and 1860 were productive of much study of hybridization in plants. Studies in the field of selection did not receive much special attention, if we may judge by the published records of the time, until during the latter part of this period.

In Germany, Koelreuter (publications from 1761 to 1766), Wiegmann (1828), and Gärtner (1849) were conspicuous workers in the hybridization of plants. The last spent some twenty-five years in making over 10,000 experiments in which about 250 different hybrids were produced. For the memoir embodying the results and conclusions of his studies, Gärtner received a grand prize offered by the Dutch Academy of Sciences. In England, Knight (various publications from 1806 to 1841) was a conspicuous worker in the field of horticulture, and Goss (1824), Herbert (1819 to 1837), and Seton (1824), contributed

important scientific work in hybridization. Meanwhile similar study was being made by French investigators of whom must be mentioned Sageret (1826), Locoq (1827–1862), Godron (1844–1863), Naudin (1855–1864) and Wichura (1865).

Much important research was done by the hybridists of this period, many of whom held views far in advance of their time and even clearly stated some of the ideas of modern plant breeders. Beginning with Knight there were those who noted that new and important varieties can be obtained through hybridization. The thought of the time was however largely dominated by views of the fixity of species. This influenced and in considerable measure determined the course of experimental studies. Much of the hybridization work aimed to obtain evidence on the relationships of species. Evidence was sought as to what forms would cross, whether the offspring were impotent or fertile, and whether the parent species could be obtained again in the hybrid progeny. Much discussion centered on the dogma that the production of fertile hybrids is proof that the parent types are not two distinct species. The literature of the time clearly reveals the wide range of results to be obtained in hybridization. This is shown especially in the general survey of the entire field made by Gärtner (1849).

During this period the work of the plant hybridizer was held in disrepute in the popular mind and in ecclesiastical circles. It was felt that such endeavor was a sacrilege which invoked decidedly abnormal processes. That the processes of fertilization are normal and are involved (with few exceptions) in all seed reproduction received strong support from the now famous work of Christian Konrad Sprengel (1793) revealing the very general adaptations for cross-pollination and the role of insects in distributing pollen. Soon after this date attention began to be directed to methods and results of selection in the improvement of cultivated plants. Undoubtedly this work was stimulated by the results of hybridization and the knowledge that cross-pollination is very general in nature.

Van Mons, a professor of chemistry and physics at the University of Louvain, and LeCouteur, of the Isle of Jersey, were

evidently the first, or at least among the first, to record the use of intensive methods of selection. Van Mons (monograph published in 1835) studied the seed progeny of fruit trees, mostly of pears. As these had been propagated by vegetative means and as some varieties of pear must be cross-pollinated if seed is produced, some of Van Mons's success in developing new varieties may perhaps be attributed to the results of cross-fertilization. LeCouteur studied wheat, which is grown entirely from seed and is adapted to self-fertilization. In 1836, LeCouteur described his methods as follows: "I proceeded to put into practice what had occurred to me to be the only secure mode to ensure the growth of pure sorts of wheat; namely, to grow them from single grains, or from single ears, and to follow up the plan, by afterwards sowing only the produce of the most productive, so as to form a stock."* At this time he had in cultivation more than 150 varieties and subvarieties of wheat. Patrick Shirreff, a Scottish agriculturist, whose work began about the year 1819 and continued for about 60 years, employed quite the same methods of selection in cereals. Still more accurate methods of pedigree and of testing and comparing the progeny of a line were developed by Hallett, whose work began about 1857.

The improvement and development of commercial varieties of the sugar-beet through selection should be mentioned in this connection. The existence of sugar in the beet was discovered in 1747 and attempts to start a beet-sugar industry were made as early as 1801. The extraordinary cost of cane sugar on the continent during the blockade of the Napoleonic wars led to the establishment of beet-sugar factories in Germany and France. With the fall of Napoleon I, the industry failed in Germany but continued to exist in France, where the improvement of the sugar beet was taken up by the firm of Vilmorin-Andrieux. Louis de Vilmorin, who directed the affairs of this eminent firm from the year 1843 until his death in 1860, became a specialist in breeding the sugar beet by selection. At first the selection of seed parents was based on such characters as size and shape of roots, but later

* On the Varieties, Properties and Classification of Wheat, p. 17.

(about 1850) determination of saccharine content became an important factor in determining seed parents. Rather special methods of studying the progeny of pedigreed stock were also devised. Selection for high sugar content soon raised the average product of the field crop from 7–8 per cent. to 14–16 per cent and this has been an important factor in the modern development of the beet-sugar industry. Repeated and regular selection is, however, necessary to maintain this average but this has been greatly facilitated by the discovery in recent times of simpler and more accurate methods of determining the sugar content.

The main object of the pedigree methods developed in breeding cereals and sugar-beets was to sort out valuable strains and to keep them pure by preventing cross-fertilization between them or with poorer strains.

The popular and, to some extent, the scientific point of view decidedly shifted in the middle of the last century, largely due to the now famous publications of Charles Darwin. A mass of evidence was presented by him showing that animals and plants are continually developing hereditable variations under domestication. It was pointed out that the old, old method of selection had always been an efficient means of improving cultivated plants and animals. It was maintained that, through the accumulation of hereditary variations by natural selection, new and quite distinct species develop from a common ancestor. This doctrine attracted attention to the practical results to be obtained through the selection for desirable qualities. Many conceptions as to the methods of evolution were advanced, and theories were formulated regarding the causes of variation and the mechanism of hereditary transmission.

Hybridization thus became recognized as a natural means of inducing variation and its use in practical breeding work became more general. Artificial selection was conceived to be effective in accumulating slight variations as well as in isolating marked sports that appear. Thus two methods of selection developed. One was based on close or line pedigree of the progeny of individuals of conspicuous merit. The other method, known as "mass selection" aimed at the continuous improvement of a

stock as a whole; a number of individuals were involved instead of one in the selection of parents. Methods of mass selection were developed, especially by breeders of cereals and sugar-beets in Germany and France.

The next great step which contributed to a better understanding of the physiology of reproduction and heredity came through the extension of knowledge regarding the minute structure and organization of cells, of the mechanism of cell divisions, and of the behavior of the parts of the cell in spore formation and in fertilization. For a long time discussion had been rife and often bitter as to what each of the parents contributes to the offspring. One school of thought maintained that the egg cell supplies the physical material needed for the transmission of hereditary qualities. Another school held that the sperm supplies these materials. Certain hybridists, however, who had observed that reciprocal hybrids very often give quite identical progeny, concluded that egg and sperm contribute germ plasm equally. These points of contention were largely settled between the years 1870 and 1890, by the revelations of the microscope. The cells, already recognized as the units of structure of the living organism, were found to consist of different parts which undergo various development in the processes of growth and division. The most permanent of the structures are the rod-shaped pieces of what is called germ plasm. These units, known as chromosomes, are found to be remarkably constant as to size, shape, and number in all body cells of all individuals of a race or species. It was found that the two sex cells which fuse in fertilization contribute, except in special cases, an equal number of these visible units of germ plasm. The plant or animal into which a fertilized egg develops is therefore a dual organism with cells containing a double number of pieces of germ plasm: maternal and paternal chromosomes live side by side in the cells and when the cells divide the mechanism gives normally an equal division of all the units. When spores are formed (from which sex cells arise directly or indirectly) the mechanism gives an intimate mixing or fusion of the two sets of units, followed by the reappearance of the same number of units and their separa-

tion into two groups. The resulting spores and later the sex cells possess therefore only half of the number of chromosomes. Fusion of the sex cells in pairs gives again the double number in the new generation of spore-producing individuals.

These discoveries attracted attention to the continuity of the germ plasm, to the individuality of its units, and to the possibility that these may possess qualitative values as bearers of hereditary characters.

In general the main aspects of these observations were well established by the year 1890. The time was therefore most opportune for the so-called rediscovery of Mendel's laws of hybridization, originally published in 1866. The essence of these conceptions is that characters are the units of heredity and are represented and transmitted as such by independent units of germ plasm. In a hybrid of the first filial generation (abbreviated as $F_1$), one of a pair of contrasted parental characters tends to be dominant and the other tends to be latent or recessive and thus disappears temporarily. Thus the members of this generation exhibit only the character of one parent. In the processes of spore formation in the individuals of this generation and in the fertilizations immediately following, the unit characters are redistributed and recombined in pairs by chance. Thus a dominant and a recessive pair of characters from two parents are considered to become reassembled in the second hybrid generation in the following ratio: (1) dominant with dominant: (1) dominant with recessive: (1) recessive with dominant: (1) recessive with recessive. Various investigators previous to Mendel had utilized the method of comparing pairs of contrasted characters and had observed that characters often segregate with decided purity in the hybrid offspring and that the second generation usually differs from the first in range of variation and in the reappearance of the various parental characters. All that was really new in Mendel's method was the making of counts which revealed the evidence that the segregation may be in simple mathematical ratios.

Thus if the parents crossed differ in two pairs of characters, one of which is dominant from each, the young embryo plants

of the $F_1$ generation will all exhibit the dominant qualities and the $F_2$ will exhibit all combinations of dominant and recessive characters. To refer to Mendel's studies with garden peas, when a yellow wrinkled strain is crossed with a green round strain the immediate offspring (the embryo peas in the seeds) are yellow and round with the characters green and wrinkled recessive. In the next generation all possible recombinations give the following combinations and ratios.

In the following notation the dual composition of the plant upon which the transmission of characters depends and the appearance of the plant through the expression of characters are both indicated by printing the names of dominant characters in capitals and the names of recessive characters in small type. Recessive characters come into expression only where they exist free from the paired dominant.

According to Mendelian interpretation the second generation in the case in question should be as follows:

(I) 1 (YELLOW YELLOW, ROUND ROUND):
2 (YELLOW green, ROUND ROUND):
2 (YELLOW YELLOW, ROUND wrinkled):
4 (YELLOW green, ROUND wrinkled):
(II) 1 (YELLOW YELLOW, wrinkled wrinkled): 2 (YELLOW green, wrinkled wrinkled):
(III) 1 (green green, ROUND ROUND): 2 (green green, ROUND wrinkled):
(IV) 1 (green green, wrinkled wrinkled).

In respect to appearance, the plants of the second generation (in this case, the embryos of the seeds produced by the $F_1$) fall into four classes. Nine seeds out of every 16 seeds (the group I above) will, it is assumed, be yellow and round; three (the group II) will be yellow and wrinkled; three (the group III) will be green and round; and one (of the group IV) will be green and wrinkled. But only one of each group (the first mentioned) will breed true for both pairs of characters; in one of these the two pairs of dominant characters are combined, and in one the two pairs of recessive characters are combined. This emphasizes the fact that sister plants of the second hybrid generation

which look the same may breed quite differently, and that only a few of them will breed true for the new combinations of parental characters.

According to this conception, hybridization can not produce new characters. All it can do is to redistribute and recombine those already existing in the parents. The theory decidedly changed the methods of analyzing the experimental results. All the variability appearing in a hybrid progeny was conceived to be due to recombination that could be described, expressed and represented by mathematical formulae. As to methods, the doctrine emphasized the value of making pedigreed cultures in selecting for a pure strain in which new combinations appeared. The breeding or progeny test was established as the proper test of the qualities in the two sets of germ plasm. The recognition of dominance and recessiveness makes a distinction between the expression of characters and their transmission in a latent form.

The conception of units of germ plasm representing characters led to the development of the modern doctrine of mutation (deVries, 1901). This maintained that new unit characters arise suddenly and spontaneously and are fully hereditary from their first appearance. Sharp distinction was made, in thought at least, between hereditary variation and non-hereditary variation due to environment.

The simplicity of the original doctrines of Mendelism and of mutation attracted attention. The theory of heredity presented seemed readily understood by all. It was strongly supported by the known facts regarding germ plasm as well as by much experimental evidence. The promise of the sudden appearance of hereditary units, and of the possibility of recombining them as independent units made definite results in practical breeding appear certain. In the period from 1890 to date an immense amount of experimental study has been directed to the application and testing of these theories of heredity and evolution. Of late, evidence has especially been sought regarding the arrangement of units of germ plasm and of their association in groups (= linkage). The thought of the time has been that there must be units of germ plasm and that the results of hy-

bridization must be interpreted on this basis. Many theories have been advanced thus to explain the aberrant ratios and the marked variations so frequently observed. It is perhaps too soon to judge what will be the verdict of time on the theories, but some points of fact seem certain.

It is very clear that in hybridization few characters behave as if represented by units of heredity and thus follow closely the ratios outlined above for characters in peas. Most of the apparently simple pairs of characters split into a large number of intermediate forms, and the grouping of the progeny into definite classes is most difficult. A vigorous attempt has been made by many neo-Mendelians to explain such results in terms of units or factors that interact or modify each other in producing a single character. Thus a single character, as the eye color of the wild fruit fly (a character most intensively studied) is now assumed to be due to the interaction of at least 50 different units. The doctrine of the independent and single effect of units of germ plasm, a fundamental feature of the original Mendelian theory, has however been largely abandoned. The factors concerned with the transmission and expression of eye color have, it is assumed, something to do with the heredity of every other character of the organism. The conception of multiple modifying factors recognizes that quite new qualities may appear after two strains are crossed but attempts to explain them as due to new reactions between units of germ plasm already present in the parents.

Meanwhile abundant evidence has accumulated which shows that spontaneous hereditary changes of slight magnitude frequently occur. The distinction between "mutations," slight and continuous variations, and "recombinations" has become largely one of definition. Furthermore a survey of the best and most marked cases regarded as mutations, scarcely affords a single case to which a conservative systematist would give specific rank. Distinct species evidently arise from a common ancestor by a series of divergent hereditary variations. The main features of the Darwinian doctrine of evolution continue to be substantiated. Research has however established that the germ plasm

is the seat in which most of the hereditary changes occur, and that purely external conditions are less directly involved in producing variations than was formerly believed.

As to results, the experimental studies agree very closely with the experience of the ages. When special attention is paid to the propagation of an organism, the effort to secure new varieties often meets with decided success. The large number of "mutant" races of the fruit fly and of the evening primrose are conspicuous examples of this in the field of experimental study. Of the many cases that have arisen in the practice of floriculture, the development of the modern varieties of *Dahlia* may be mentioned. It is recognized that there are about 6,500 varieties of the *Dahlia* in cultivation in the United States. All of these have descended from a single American species during the past 130 years, and the many hundreds of cactus dahlias have all appeared since 1879. The wild species is somewhat variable as to color of flowers and semi-doubleness of heads. In propagating the plant, growers have selected further from variations that have appeared spontaneously or as a result of crossing between varieties. A collection of the principal types of the *Dahlia*, such as is grown for display at the New York Botanical Garden, is "a most remarkable example of what nature's tendency to variation can do in a short time, when aided and encouraged by man."*

The horticultural history of the annual Phlox (*Phlox Drummondii*), a review of which has been presented to the readers of this Journal,† affords a case similar to that of the Dahlias. It seems certain that all of the 200 varieties of the annual Phlox have descended from a single stock of the wild Texan species which was introduced into cultivation in 1835. Many other cases well chronicled in modern horticultural literature could be cited which illustrate the possibilities of selection when a wild species is submitted to intensive breeding.

The many interesting and beautifully flowered rose-mallows sold by nurserymen are familiar to many readers of this article. These were developed by hybridizing two, and possibly three,

* Dahlias and their Culture, by M. A. Howe, *Jour. Hort. Soc. of N. Y.*, **2**: 285–301.

† Cultivated Varieties of Phlox Drummondii, by James P. Kelly, JOUR. N. Y. BOT. GARDEN, **16**: 179–191.

wild species. The hardy habit of growth of a species native to the northeastern United States was combined with the more brilliant flower colors of a species of the southern United States. In experiments at the New York Botanical Garden, the second generation of hybrids between two wild species of rose-mallow gave a most remarkable range of types with respect to color of the flowers. Some are more deeply and brilliantly colored than either of the parent species, a result frequently attained in hybridization.

It has long been recognized that the intermediate between two contrasted parental characters very often appears in hybrids. Even when characters tend to segregate as Mendelian units or as groups of units some of the second generation may be intermediates. The value of these as material for selection in producing new races is obvious. Recent studies with corn have emphasized this aspect of plant breeding in showing that quite a new type of "meal" corn can be obtained by selecting for intermediates between sweet and dent or flint races. As a rule Mendelian interpretations have disregarded the intermediates which appear, but the possibility of securing qualitative intermediates between pairs of contrasted characters which will breed true is becoming generally recognized.

Perhaps the most striking cases of spontaneous variation are those of "bud sports." During the vegetative development of an individual plant, a bud or a part of a bud gives rise to parts differing from the rest of the plant. Propagation of these bud sports, especially by vegetative means has always been very effective in developing new races. The large number of sport varieties of the Sword-fern have thus been obtained in recent years.*

By propagating from bud sports of the variegated *Coleus* the writer was able to secure in the course of three years 16 different types or varieties. The frequent occurrence and the economic significance of bud variations giving a poor quality of fruit has recently been noted by specialists of the United States Department of Agriculture in studies of citrus fruits grown in California.

* Some Modern Varieties of the Boston Fern at their Source, by R. C. Benedict, JOUR. N. Y. BOT. GARDEN, 16: 194–197.

The breeders of plants and animals, whether prompted by practical or by scientific interests, have gained many points of guidance from the results of the intensive studies prosecuted during the past 30 years. Experimental studies in hybridization very fully support the inferences based on the knowledge of the dual nature of the spore-producing organism and of the observed behavior of germ plasm units in fertilization: (1) that the variation to be expected from hybridization first appears in the second filial generation; (2) that parental characters tend to segregate in this generation; (3) that characters of the parents can thus be combined; and (4) that an intermediate between a pair of contrasted parental characters can often be obtained. The second generation should therefore be grown in sufficient number to give chance for the range of recombinations and variations. Selection for new races should be begun with individuals of the second generation. Because of the dual nature of the spore-bearing plant, sister plants that appear quite alike will often breed differently from seed, especially for characters that are dominant. Because of this, selection for new races should be begun with several lines of self-fertilized descent.

Experimental studies have fully established the merits of methods of controlling pollinations and of growing pedigreed lines. The simple expedient of "bagging," or enclosing flowers in semi-transparent paper bags, is an efficient means of control. When cross-pollination is to be made the stamens should be removed before any pollen is shed. Proper pollination can be made when the pistils are receptive. Labelling flowers, collecting and planting seed, and growing sister plants together in pedigreed lines are matters of detail and record. Such methods eliminate uncertainty as to parentage, and are recognized as necessary in all exact studies. The efficiency of these methods in securing accuracy and in saving time should lead to their more general application by amateur gardeners and commercial seedsmen and nurserymen.

Methods of pedigreed culture with selection within a species or variety and without hybridization will usually show whether variations that may appear are hereditary. Such methods have

in recent years led to much improvement in many of our most important cultivated crops.

In the sugar beet selection has isolated if not developed *elite* races whose cultivation has decidedly increased the percentage of sugar and thus raised the total of sugar produced. Similar results have been attained in securing strains of corn, wheat, rye, barley, oats, rice, cotton, flax, and other crops that are best adapted to the conditions of various parts of the world. In plant breeding the pedigreed strain has acquired much the same significance that it has long held in the breeding of animals.

Experience has emphasized the necessity of continued selection. Cultivated races of plants are as a rule already highly specialized. Heredity tends to keep them thus, but variation tends to introduce new or at least other hereditary features. In many cultivated races evolution seems to have reached its limit, at least in the development of desirable qualities, and many variations or "reversions" appear which give poorer strains. The application of methods of selection is needed to sort out and eliminate these.

Many of our important economic plants are annuals and a new crop is grown from seed each year. Each seed produced involves a fertilization which brings two sets of germ plasm into intimate relationship. There is abundant opportunity for hereditary units to reassemble in every possible relationship, of which some may be quite new. There is opportunity for chemical interactions that of themselves may form the basis of new hereditary qualities.

Studies in genetics aim to discover those laws of heredity and variation which reveal the physiology of reproduction. Much knowledge has been gained in recent years regarding the transmission of units of heredity. Evidence of the frequent occurrence of "mutations" has accumulated. Much remains to be learned regarding the development of characters in the organism and of the causes of hereditary mutations.

In practical application, the methods of plant breeding aim (1) to maintain in a highly productive condition races whose qualities make their cultivation desirable, (2) to recognize and

preserve new characteristics which may lead to further improvement, (3) to combine qualities of different strains into one strain through crossing, and (4) to induce hereditary variations through hybridization. Plant breeding aims to regulate, to control, to direct, and to utilize the processes of heredity and variation.

A. B. STOUT

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## CONFERENCE NOTES FOR DECEMBER

The regular monthly conference of the Scientific Staff and Registered Students of the Garden was held on the afternoon of December 3. The program consisted of reports by Dr. F. J. Seaver and Dr. Wm. A. Murrill on "Summer Field Meetings of Pathologists and Mycologists in New York and Connecticut."

An abstract of Dr. Murrill's report is as follows:

The science of plant pathology, or the investigation and control of diseases of plants, particularly those caused by fungi, has been pushed forward of late with greater rapidity in the United States than in any other country.

During the period of the war, experts in this field from the different states coöperated very closely to save as much as possible of every crop from the ravages of disease; and during the past summer, the idea of coöperation was continued and extended with great success. In the neighborhood of New York City, two important field meetings were held, one on Long Island and one at New Haven, Connecticut, for the study of diseases common in those localities.

The first meeting, in June, for the study of potato diseases in particular, was attended by about one hundred plant pathologists representing many parts of America, England, and Holland. The farmers furnished motor-cars and tours were arranged to the chief potato-growing sections of Long Island. In the evenings, mosaic, leaf-roll, wart disease, and other potato troubles that have been found difficult to combat were discussed at length, with the best experts in the world on the spot to consider the best methods of control.

The second meeting was held in Connecticut in August and was attended chiefly by experts from New England and New York. Automobile tours covering a distance of three hundred miles were made to plantations, gardens, and nurseries between New Haven, Hartford, and Storrs; while every evening of the week was devoted to papers and discussions.

The largest greenhouses in America were seen at Cromwell, where 22 acres are under glass, one house being 800 feet long and another 500 feet square, the latter entirely filled with roses.

The largest elm in the United States was seen at Wethersfield. It is 30 feet in circumference, 97 feet high, and 250 years old. It stands on the edge of the highway without protection of any kind.

A day was spent in the tobacco-growing regions of Connecticut, where broad-leaved tobacco is grown in the open and narrow-leafed varieties are cultivated under tents. At one place, about 290 acres were grown under cloth at a cost of a million dollars. The variety thus raised sells for over a dollar a pound. No wonder that mosaic, burn, root-rots, and other tobacco diseases are studied with great care! This year the yield of tent-tobacco was enormous, probably owing to the frequent rains.

Dr. Fred J. Seaver first described a collecting trip to Ithaca, New York, June 2–7. This was in collaboration with representatives of Cornell University, the Brooklyn Botanic Garden and Syracuse University, and its purpose was the collection and study of fungi, especially of the parasitic groups and the ascomycetes.

On arrival in Ithaca Sunday evening, June 2, it was found that Professor Whetzel had the detail of the week's stay well planned. This was to consist of three rather extended excursions by automobile and train, interspersed with shorter trips to points within easy reach of the Cornell University campus, and also some time was to be spent in the laboratory taking care of the material collected.

The first trip, on Monday, June 3, was to Enfield Gorge, about seven miles from Ithaca. The party was taken by automobile in the morning and returned late in the evening, so that the entire

day was spent on the collecting grounds. A number of cup fungi and other species of especial interest were collected.

The next long trip was to Labrador Lake, about forty miles from Ithaca. This trip also yielded interesting results. The third and last of the long trips was on Saturday to the McLean woods and bogs. This region was exceedingly interesting because of the variety of local conditions, and much more time could have been advantageously spent there.

The collections made during the week were divided into three parts, most of the parasitic fungi being left with the University. Certain specimens were taken by Dr. Olive of the Brooklyn Botanic Garden, and most of the ascomycetes, including all of the cup fungi, were brought to New York by the writer. Three duplicate sets were made, one for each of the three institutions represented, the University furnishing suitable labels. The week's field-work added over two hundred specimens to our fungus collections, and some of these will undoubtedly be of more than usual interest.

Dr. Seaver also described a two days trip with the potato pathologists on Long Island, as has been noted above by Dr. Murrill. An account of this latter event has already appeared in the JOURNAL for August (p. 162).

A. B. STOUT,
*Secretary of the Conference*

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## GREENHOUSE LECTURES

### FEBRUARY AND MARCH, 1920

Free Public Lectures will be delivered in the Central Display Greenhouse, Conservatory Range 2, of the Garden, Bronx Park, Saturday afternoons at 3:15 o'clock:

February 21. "The Cactus Family," by DR. W. A. MURRILL.

February 28. "Plants with Variegated or Colored Foliage," by DR. A. B. STOUT.

March 6. "House Plants," by MR. G. V. NASH.

March 13. "The Pineapple and Its Relatives," by W. A. MURRILL.

March 20. "Forcing Bulbs for the Home," by DR. M. A. HOWE.

March 27. "The Calla Lily, and Its Relatives," by MR. G. V. NASH.

The lectures, which occupy half an hour, will be illustrated by living plants and followed by demonstrations in the greenhouses.

Conservatory Range 2 is situated at the eastern side of the Botanical Garden, north of the Allerton Avenue Entrance. It is most conveniently reached from the Allerton Avenue Station on the White Plains Road Extension of the Subway from East 180th Street. The Conservatory is open to the public daily from 10 to 4.

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## NOTES, NEWS AND COMMENT

Dr. and Mrs. N. L. Britton and Dr. J. K. Small spent most of December in Florida, with headquarters at Miami. This expedition is a continuation of the recent work of exploration in the Everglade region of southern Florida, which has already been mentioned in this Journal and some of the results of which have been published (JOURNAL **20**: 21–39, 191–207. 1919).

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The enrollment in the courses of instruction in gardening has increased steadily during the autumn months and at the time of going to press included forty-one students. All but two of these are discharged soldiers or sailors, in training under the Federal Board of Vocational Education. The large registration has necessitated the employment of a third instructor who will devote his entire time to this work, beginning January 1, 1920. Mr. Elba E. Watson, M.A., of the University of Illinois, has been appointed and will take the classes in botany, leaving the practical instruction in gardening and greenhouse work to Mr. Kenneth R. Boynton, supervisor of gardening instruction and Mr. Walter Balch, assistant.

Late in the summer of 1919, the Department of Parks was given an appropriation for the construction of a drive connecting the present Mansion drive with Bronx Park East, and extending past the northern side of the Rose Garden. Work has progressed steadily, and the drive when completed will form an important link in the Garden's system of roads. At the same time, considerable work has been accomplished in the construction of footpaths near the Rose Garden and near the Iris Garden entrance at Pelham Parkway.

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Dr. W. A. Murrill lectured at Yama Farms Inn, November 8, on the subject of "Edible and Poisonous Mushrooms."

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During November Dr. Francis W. Pennell spent some days in Charleston, South Carolina and verified certain type-specimens in the Elliott Herbarium in that city. This collection—the work of Stephen Elliott whose "Sketch of the Botany of South Carolina and Georgia," published exactly a century ago, is the most classic flora of the South—is in the care of the Charleston Museum, and is appreciated at its real worth. It is pleasing to find an historic herbarium so guarded, and also to find it located in the immediate region to which its value pertains. What recent student of our southeastern plants has not wished that the yet older, and much more difficult, herbarium from South Carolina—that of Thomas Walter—had never crossed the ocean, even though it has found a home in the British Museum!

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The following visiting botanists have enrolled in the library since the last issue of the JOURNAL: Professor Charles S. Boyer, Philadelphia, Pa., Harold W. Pretz, Allentown, Pa., and Professor W. A. Setchell, Berkeley, Calif.

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Dr. W. A. Setchell, who is enjoying a sabbatical year of absence from his duties as head of the department of botany at the University of California, spent several weeks in December and January at the Garden, studying some of the brown seaweeds of the Pacific Coast. A critical monograph of the blue-green algae

(Myxophyceae) of the Pacific Coast, by Professor Setchell and his colleague, Dr. N. L. Gardner, has recently been published, and the manuscript for a similar volume on the green algae (Chlorophyceae) of the same region is now ready for the printer.

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An informal conference of city, state, and voluntary agencies interested in nature-study and garden work for children was held at the residence of Mr. Adolph Lewisohn, 881 Fifth Avenue, on the afternoon of December 2. A large number of representatives were in attendance and the meeting was a very enthusiastic one. The Garden was represented by Dr. W. A. Murrill.

*Meteorology for November:*—The total precipitation for the month was 2.81 inches. The maximum temperatures recorded at the Garden for each week were 56° on the 9th, 60° on the 10th and on the 18th, and *63° on the 30th.* The minimum temperatures were 32½° on the 3d, 28° on the 10th, *22° on the 16th*, 24° on the 21st, and 32° on the 29th. The first hard killing frost of autumn was on the morning of the 10th.

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## ACCESSIONS

### MUSEUMS AND HERBARIUM

41 specimens of Italian marine algae. (By exchange with Egidia Corti.)

2 specimens of flowering plants from North Carolina. (By exchange with Mr. C. D. Beadle.)

1 specimen of *Bartonia verna* from Florida. (Given by Mr. Severin Rapp.)

4 specimens of mosses from Minnesota. (By exchange with Professor John W. Holzinger.)

38 specimens of mosses from Oregon, Washington, Alaska, and Java. (By exchange with U. S. National Museum.)

14 specimens of mosses from Florida. (By exchange with Mr. Severin Rapp.)

11 specimens of mosses from the Bahamas. (Collected by Mr. L. J. K. Brace.)

32 specimens of mosses from Iceland, North Carolina, and Tennessee. (By exchange with Professor A. LeRoy Andrews.)

81 specimens of mosses from North Carolina and New York. (Given by Dr. J. K. Small.)

2 specimens of mosses from Virgin Islands, West Indies. (Collected by Mr. W. C. Fishlock.)

30 specimens of hepatics and mosses from Texas. (By exchange with Dr. F. McAllister.)

3 specimens of flowering plants from southern Florida. (Given by Mr. C. T.) Simpson.)

9 specimens of flowering plants from Alabama. (Given by Dr. R. M. Harper.

50 specimens "Phycotheca Boreali-Americana," Fascicle 46. (Received for Columbia University.)

1 specimen of *Chenopodium graveolens* from Mexico. (Given by Mr. M. de Sautreppe.)

1 specimen of *Sphagnum* from the Okefenokee Swamp, Georgia. (Given by Dr. R. M. Harper.)

1 specimen of "gum resin" from *Dacryodes excelsa*, from Dominica, West Indies. (Given by Mr. W. C. Fishlock.)

25 specimens of mosses from Washington. (By exchange with Mr. E. L. Pickett.)

1 specimen of moss from Pennsylvania. (By exchange with Mr. Edwin B. Bartram.)

3 specimens of mosses from Maine. (By exchange with Miss Annie Lorentz.)

1 specimen of moss from Cuba. (By exchange with Brother Leon.)

55 specimens of ferns and flowering plants from Central America. (By exchange with Professor W. W. Rowlee.)

3 specimens of hepatics from New England. (By exchange with Miss Annie Lorenz.)

18 lantern slides of tree surgery. (Given by The Davey Tree Expert Company.)

1 specimen of moss from Ohio. (By exchange with C. M. Shipman.)

8 specimens of mosses from Japan and Hawaii. (By exchange with Mr. E. B. Chamberlain.)

1 specimen of moss from Ontario. (By exchange with Dr. O. E. Jennings.)

42 specimens of mosses from California. (By exchange with Miss Alice Eastwood.)

2 specimens of mosses from Japan. (By exchange with Dr. V. F. Brotherus.)

7 colored lantern slides of orchids. (Purchased from Miss E. M. Kittredge.)

30 lantern slides of Ecuador vegetation. (Purchased from Dr. J. N. Rose.)

2 specimens of *Quercus Catesbaei Rappii* from Florida. (Given by Mr. Severin Rapp.)

1 specimen of *Lupinus subhirsutus* from California. (Given by Dr. Anstruther Davidson.)

1 colored lantern slide of *Monotropa uniflora* from Lake Mohonk, New York. (Given by Professor R. S. Barlow.)

1 specimen of *Berberis canadensis* from Virginia. (Given by Mr. C. A. Ludwig.)

2 specimens of "wooden-flowers" from Central America. (Given by Dr. L. A. Wailes.)

18 specimens of mosses from Colorado. (By exchange with Dr. F. E. Lutz.)

9 specimens of mosses from Alaska. (By exchange with Mr. C. W. Thornton.)

22 specimens of mosses from Wisconsin. (By exchange with Dr. C. F. Millspaugh.)

1 specimen of moss from New Jersey. (By exchange with Miss Northrop.)

13 specmens of flowering plants from the White Mountains, New Hampshire. (By exchange with Harvard University.)

27 specimens of native fruits. (Given by Dr. H. H. Rusby.)

10 specimens of nut meats from Europe. (Given by T. H. Duche & Sons.)

36 specimens of cultivated food products. (Given by Dr. H. H. Rusby.)

5 specimens of coffee. (Given by Mr. P. L. Johnson.)

11 specimens of fodder plants. (Given by Dr. H. H. Rusby.)

14 specimens of grapes from Texas. (Given by I. V. Munson & Company.)

8 specimens of tanning materials. (Given by Dr. H. H. Rubsy.)

5 specimens of rubber from Singapore. (Given by Professor F. E. Lloyd.)

14 specimens of spices. (Given by Dr. H. H. Rusby.)

20 specimens of fungi from Pennsylvania. (By exchange with Mrs. V. W. Delafield.)

4 specimens of fungi from the New York Botanical Garden. (Collected by Mr. Felix F. Wilmousky.)

1 specimen of *Aster sagittifolius* from New York. (Given by Dr. Anna E. Perkins.)

14 specimens of hepticae from Alaska. (By exchange with the United States National Museum.)

2 specimens of *Aster* from Princeton, New Jersey. (Given by Professor W. M. Rankin.)

1 lantern slide. (Given by The Conrad Slide and Projection Company.)

29 specimens of fungi and slime moulds from Pennsylvania. (By exchange with Mrs. V. W. Delafield.)

2 specimens of fleshy fungi from Rio Piedras, Porto Rico. (By exchange with Prof. F. S. Earle.)

3 specimens of *Phyllosticta* from Wisconsin. (Given by Dr. J. J. Davis.)

3 specimens of fungi from New Hampshire. (By exchange with Dr. L. O. Overholts.)

20 specimens, "Fungi Wisconsinenses Exsiccati." (Distributed by Dr. J. J. Davis.)

2 specimens of fungi from Campe Meade, Maryland. (By exchange with Mr. C. A. Schwarze.)

1 specimen of *Sclerotinia Geranii* from New York. (Collected by F. J. Seaver.)

8 specimens of fungi from Porto Rico. (By exchange with Professor F. S. Earle.)

1 specimen of *Stereum albobadium* from Cuba. (By exchange with Brother Leon.)

4 specimens of fungi from South Carolina. (By exchange with Professor G. W. Wilson.)

1 specimen of *Melanoleuca phaeopodia* from Toronto, Canada. (By exchange with Professor J. H. Faull.)

1 specimen of *Septobasidium cirvatum* from the Bahamas. (Collected by Mr. L. J. K. Brace.)

1 specimen of *Mycenastrum oregonense* from Utah. (By exchange with Professor A. O. Garrett.)

1 specimen of *Sclerotinia smilacina* from Ithaca, New York. (Given by Professor H. H. Whetzel.)

17 specimens of native food products and condiments. (Given by Dr. H. H. Rusby.)

4 specimens of dyeing materials. (Given by Dr. Samuel Hooker.)

5 specimens of cotton. (Given by Dr. E. B. Southwick.)

1 specimen of vanilla-bean. (Given by Dodge & Alcott.)

34 specimens of economic plants from New York. (Collected by Messrs. Williams and Wilson.)

18 specimens, illustrating the manufacture of pyraline. (Given by E. I. du Pont de Nemours & Company.)

1 specimen of *Vulgaria globosa* from Ontario. (By exchange with Professor J. H. Faull.)

1 specimen of *Trichopeziza sulphurea* from New York. (By exchange with Professor H. H. Whetzel.)

26 specimens of flowering plants from New Brunswick. (By exchange with Harvard University.)

1 specimen of candle-nut from Porto Rico. (By exchange with ————————)

26 specimens of flowering plants from Colombia. (By exchange with Dr. M. T. Dawe.)

1 specimen of *Ranunculus* from New Jersey. (Given by Miss A. M. Seifert.)

11 specimens of *Ochroma* from Central America. (Given by Professor W. W. Rowlee.)

235 specimens of flowering plants from Quebec. (By exchange with Brother Victorin.)

402 specimens of flowering plants from North America. (By exchange with the United States National Museum.)

98 specimens of flowering plants from North America. (By exchange with Harvard University.)

212 specimens of flowering plants from Canada. (By exchange with the Geological Survey of Canada.)

450 specimens of lichens from southern Florida. (Collected by Dr. and Mrs. N. L. Britton.)

1960 specimens of ferns and flowering plants from Florida. (Collected by Dr. J. K. Small.)

870 specimens of ferns and flowering plants from southern Florida. (Collected by Dr. N. L. Britton and Dr. J. K. Small.)

65 specimens of drugs. (Given by Parke, Davis & Company.)

88 specimens of drugs. (Given by Dr. H. H. Rusby.)

7 specimens of drugs. (Given by Peek & Velsor.)

30 specimens of drugs. (Given by Merck & Company.)

3 specimens of drugs. (Given by Seabury & Johnson.)

8 specimens medicinal products. (Given by Seabury & Johnson.)

7 specimens of native fruits from Ohio. (Given by Dr. J. A. Lloyd.)

7 specimens of native fruits from Alabama. (Given by Dr. R. M. Harper.)

1 specimen of a native fruit from New Jersey. (Given by Mrs. E. W. Given.)

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# JOURNAL

OF

# The New York Botanical Garden

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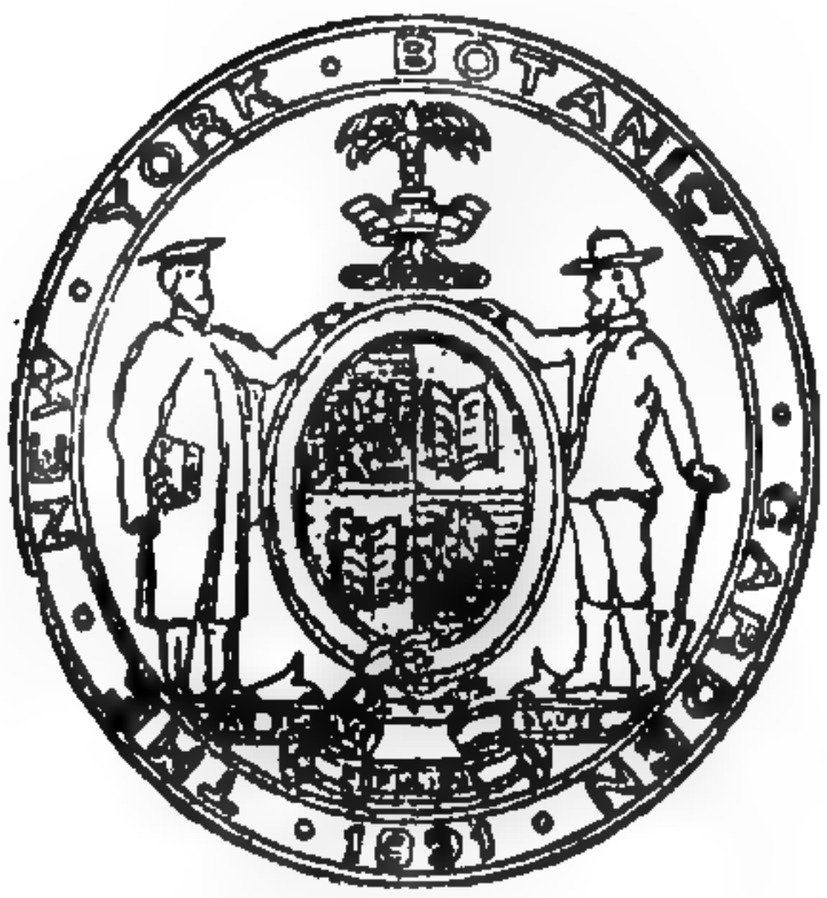
*Assistant Director*

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JOURNAL

OF

The New York Botanical Garden

VOL. XXI February, 1920 No. 242

# OF GROTTOES AND ANCIENT DUNES

## A RECORD OF EXPLORATION IN FLORIDA IN DECEMBER 1918

WITH PLATES 241 AND 242

Botanical exploration in Florida in recent years has shown that state to be much more of a cactus center than was formerly supposed. Certain observations in the course of our field-work there during the past decade and the record, over a century and a quarter old, of a large prickly-pear, native in a region still uninhabited, determined the writer of this paper to devote a few days during the early part of December, 1918, to further investigations, as well as to studies in the cactus plantation of Mr. Charles Deering at Buena Vista, Florida. The field-work, carried on mostly in hitherto unvisited parts of the state, and the studies in the garden above referred to made our knowledge appear so complete, that a preliminary interpretation of the genus *Opuntia* as it was then known to occur in Florida was attempted, and the main features were outlined on some earlier pages of the Journal.[1] The extensive field-work described on the following pages was made possible through the interest of Mr. Charles Deering, who has also generously coöperated in previous, as well as in subsequent, field excursions.

### NORTHERN FLORIDA

The excursion took us to the western and southern extremes of the mainland, and much new territory in the interior of the

[1] Journal of the New York Botanical Garden 20: 21–39. *pl.* 224 226. 1919.

peninsula was visited. Our first objective in Florida was Pensacola, which is situated in the extreme western part of the state and is built on the meeting ground of two geographical regions, the western Florida coast region and the western Florida pine hills. It is less than ten miles from Perdido Bay on the Alabama line on the west and the Gulf of Mexico on the south. The surrounding region is superficially, from a geologic standpoint, Pleistocene and recent formations. The flat portion near Pensacola Bay (western Florida coast strip) is backed by rolling hills (western Florida pine hills) which "rise to one hundred and one hundred and fifty feet." The hills adjacent to Pensacola are sparingly forested with a mixture chiefly of the sand-pine and turkey-oak. Of course, the pine trees were in beautiful leafage, and the dead, but bright red leaves of the oak were still persistent on the branches. The other shrubs, were bare, but the buds for the approaching spring were evident and the sand-loving mosses were starting new growth. The season when seeds and plants sprout and grow in the southern coastal plain is usually several months in advance of spring at the North. A shrubby evergreen-goldenrod (*Chrysoma pauciflosculosa*), contrary to its assigned habitat, the littoral belt, was in bloom everywhere on the dry hills north of the town.

On the higher level stretches in place of pine woods, apparently chiefly caused by slight moisture-collecting depressions in the land, were occasional hammocks of beautiful live-oak trees with wide-spreading branches.

Our errand was for cacti and ferns, and we were not wholly disappointed in our search, for we found one prickly-pear (*Opuntia Pollardi*) and one fern (*Pteris aquilina*)!

In the low land along Escambia Bay, an interesting phenomenon was observed. The flats near the shore in some places supported a growth of the live-oak and the magnolia within reach of the tide, as is the case with the hickory on the shore of Apalachicola Bay.[1] The trees seem none the worse for their saline environment.

A few miles east of the Escambia River and Escambia Bay

[1] Journal of the New York Botanical Garden 19: 5. 1918.

lies one of the botanically little-known and very interesting regions of Florida. It is situated between the 85th and 87th meridians. In fact all the state west of the Apalachicola has been neglected from a botanical standpoint. The least known part lies between the 86th and 87th meridians, and within these limits and occupying about one-third of the area is the Choctawhatchee Division of the Florida National Forest. I do not know of a single collector who has explored it, although some observations have been made there, and its vegetation is little known, except for a list of shrubs and trees brought together for a preliminary report on the reservation by agents of the National Forest Service.

This district lies wholly within the western Florida pine hills and comprises three geological formations—from north to south the Oligocene, the Miocene, and the Pleistocene. In altitude and topography it ranges from the flats at sea-level to hills said to be approximately three hundred feet high in the interior.

The most conspicuous trees in the higher parts, as in the Pensacola region, are the pine, in this case the long-leaf-pine, and the turkey-oak. Altogether, ninety-six woody plants, including several naturalized exotics, have been reported for the Choctawhatchee National Forest, of which eight trees are of commericial importance. Nearly all of these, which are for the most part broad-leaved shrubs and trees, grow in the hammocks and swamps bordering or near the several rivers and creeks that flow across the reservation.

In that region we find only sandy soil without exposed rocks. Eastward, however, outcrops of limestone appear. Hardwood forests and short-leaf pine increase until the pinelands of the eastern Florida flatwoods are encountered.

In middle and western Florida we find a mingling of northern and southern floras, the former extending down the hills and ridges of western Georgia into the hilly country of northern Florida, and the latter extending up from the warm Gulf Coast nearby.

The middle portion of northern Florida is a rather extraordinary plant region and one perhaps more interesting, on account

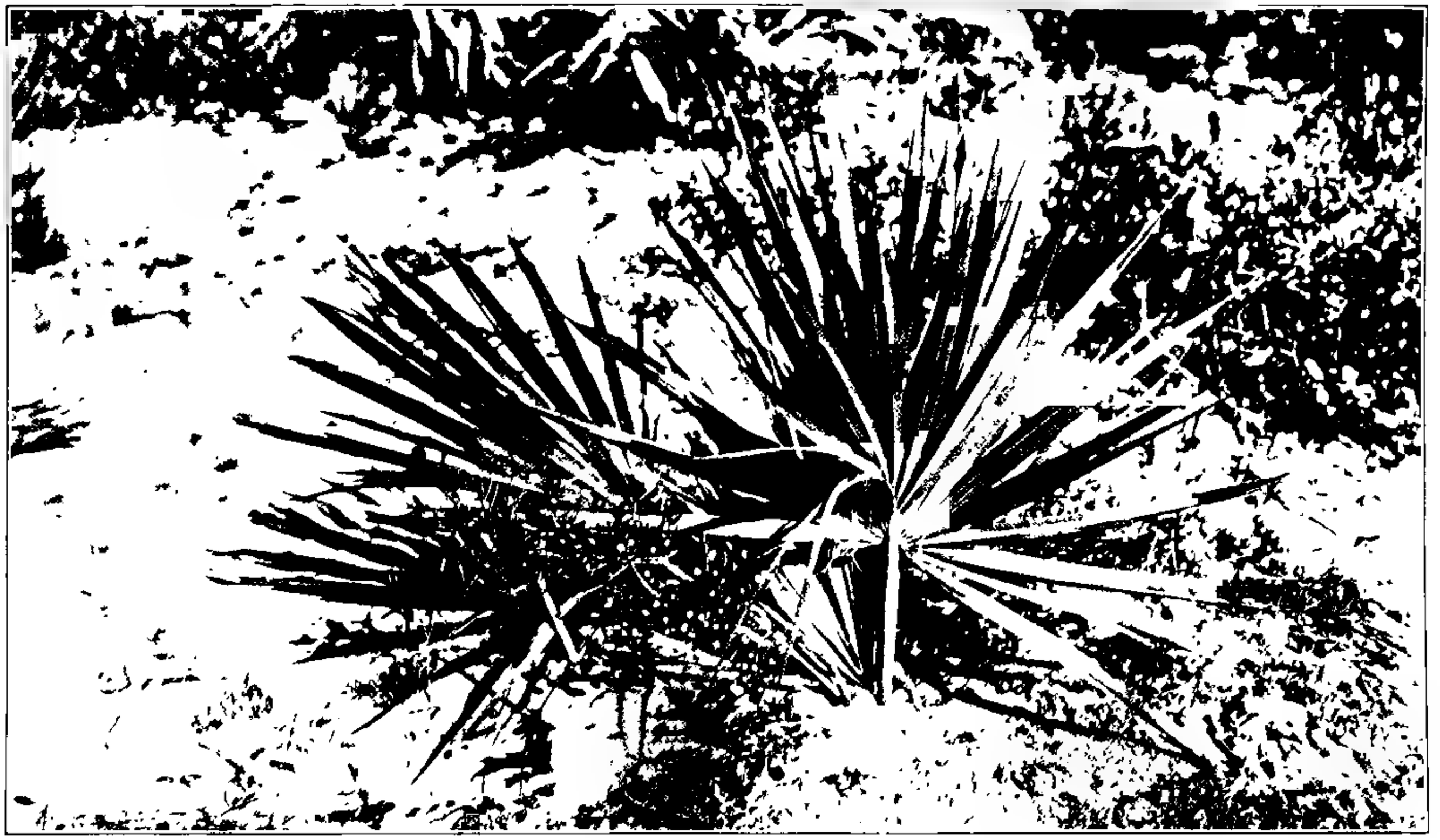
of some of its endemic plants, than either the eastern or the western portions. In it, and also in adjacent parts of Alabama and Georgia, we find an exceptional number of endemic species ranging from inconspicuous herbs to large shrubs and trees. The herbaceous plants are too numerous to mention in a paper of this scope. The two noteworthy trees of this category are the yew (*Taxus floridana*) and the torreya, more commonly known locally as stinking cedar, (*Tumion taxifolium*) neither of which have arboreous relatives in the New World nearer than California.

Working by day and traveling by night soon brought us to the northern part of the Florida peninsula at Gainesville. There we stopped long enough to examine in the State University grounds the plantation of *Zamia* made from plants collected a year previous about twelve miles west of Gainesville.[1] These plants had been set out adjacent to a similar plantation of *Zamia floridana* brought several years before from the Miami region or the Everglade Keys. As far as the newly planted specimens had grown they appeared almost identical with those from the southern end of the peninsula. Now the interesting question arises: How can we account for the northern outlying stations of this *Zamia!* Do they represent the remains of a formerly more extensive geographic range or do they represent an extension of range in reasonably recent time? That is, did the plants come there through natural modes of seed-dispersal or were they introduced by means of plants brought from further south in the peninsula by the aborigines of Florida, or by the Seminole Indians who formerly, like the aborigines, as well as lately, used the caudex as a source of starch. Further field-work, which the writer hopes some day to carry on, may perhaps determine these points. Thus, scores of interesting problems arise, some of which can be solved only by extended investigations in the field.

## Lake George Region

From Gainesville we went south to Ocala. Both these places are situated in or near the lime-sink region, which, too, is in need

[1] Journal of the New York Botanical Garden **19**: 74. 1918.



The "scrub" in the Ocala Division of the Florida National Forest, west of Lake George, December, 1918. Fruiting plant of the scrub-palmetto (*Sabal Etonia*) growing in the snow-white sand. This palm is mostly confined to the "scrub." It was named for the Etonia "Scrub" which lies a few miles south of the Lake George region. The cabbage (bud) of this palm is collected and eaten like that of the cabbage-tree (*Sabal Palmetto*)

of botanical exploration, but the very limited time at our disposal prevented us from making even a beginning, as we had gone to Ocala merely to gain entrance to the Lake George country which lies to the eastward.

The lime-sink region is characterized by rolling sandy hills clothed with pine trees, circular or irregular sinks, few streams and often large boiling springs in the lower levels or near the streams. The boiling springs, some shallow, others very deep, are often the direct sources of streams that are feeders of Ocklawaha River or the Saint John's River. All this is very enticing to the collector and also exasperating to him when he traverses the region and is unable to devote time to an investigation of it. At Ocala we procured a motor-car and proceeded directly to the lake region, calling at the headquarters, east of Lynn, of the Ocala Division of the Florida National Forest, where Mr. C. H. Rogers, forester-in-charge, joined us and spent the day with us driving over the reservation.

As the purpose of our journey was to find prickly-pears near Lake George, we took the nearly straight and very narrow trail directly to Juniper Springs and soon found ourselves in a region that had not been botanically investigated for nearly a century and a half. A large part of the territory east of the Ocklawaha River and west of the Saint John's consists of the so-called "scrub." It is a series of ancient and now stationary sand-dunes. The sand is fine-grained and usually snow-white. Woody vegetation is conspicuous and plentiful, although stunted; herbaceous vegetation is rather inconspicuous and scattered, never massed.

A score of shrubs are evergreen; most conspicuous among them is the rosemary (*Ceratiola*). It grows as a broom-like bush from three to eight feet tall, has very numerous, but also very small, reddish or yellowish flowers in fall and winter and, later, small globular fruits clustered along the branches. However, neither flowers nor fruits are conspicuous; but the deep-green of the myriads of crowded leaves stands out very conspicuously against the white sand. This plant is widely separated from its two relatives in the United States—the crowberries (*Empetrum*

and *Corema*)—both of which are mainly boreal in their distribution.

The prickly-pear of the region was soon found growing all over the sand-ridges, many of the plants bearing both flowers and fruits. The scrub-palmetto was plentiful and in the height of its fruiting season.

These sand-ridges constitute the northern portion of the "scrub." Thence it extends nearly directly southward perhaps somewhat interruptedly for one hundred and fifty miles in about the middle of the peninsula, with branches and outlying areas extending towards and to both the Gulf and Atlantic coasts and to about fifty miles from the southern end of the peninsula.

East of the "scrub" are extensive prairies, pine woods, hammocks, and shell mounds, and less in area, but not least interesting, lime-sinks. It is withal a strange country and it might be, by some, considered uncanny or even dangerous. The land is liable to cave in beneath one's feet and drop one in the bottom of a shallow pit or, if the distance should be sufficient, submerge one below the water-table. There are sinks on record, between Ocala and the Saint John's River, that have carried the forest trees down over fifty feet, and where the trunks may still be seen submerged in the clear water. We found sinks of various sizes and shapes, some with boiling springs which spread out into lake-like expanses, others with small trickling springs whose waters seeped away in the bottom of the sink. The more well-like sinks often formed beautiful fern grottoes.

This land, with its extensive prairies, its lakes, forests, and springs, was evidently a favorite locality with the aborigines, as is evidenced by the shell mounds in the vicinity of Lake George. We finally reached the western shores of Lake George and perhaps stood on the very spot where the Bartrams[1] camped during their travels in that region about a century and a half ago.

[1] John Bartram (1699 1777), the first native American botanist, was greatly encouraged in his work as a collector of seeds and living plants by correspondence with Peter Collinson (1694–1768), of London, who eventually secured him an appointment as "King's botanist." Bartram traveled and collected from New York to Florida. In the summer of 1765, at the age of 66, he explored the Saint John's nearly throughout its length, and several of its tributary streams.

The prickly-pear that occurred scattered in the "scrub" grew in large colonies on the level shore or kind of flood-plain of the lake between the forested edge of the water and the hammock on the higher ground in the rear.

Thence we began a circuitous route through the more northern parts of the reservation. It was there we found the prickly-pear in its greatest development.[1] This species, using the term in a horticultural way, might be called the standard prickly-pear. When fully developed it grows to a height of six to eight feet, with a single stem, often over six inches thick, and a widely branched crown.

The first botanical record of *Opuntia* in Florida appears to be an account of a plant from the Lake George region by William Bartram in his "Travels"[2] in 1791. We had hoped to rediscover and identify the Bartram plant, but the one we found, although agreeing with Bartram's description in size, differs fundamentally from the description in the armament and the fruits. The Bartram plant remains to be rediscovered, unless it has been exterminated by the half-wild cattle that have roamed that country for a century or two. The cattle even now browse on the joints of the plant we found there, in spite of its copious armament of spines.

Both the Florida species of *Zamia* grew in that region—*Zamia floridana* in the pinewoods and *Zamia pumila* in the hammocks and sink-holes. Doubtless both these species were observed by the early travelers in these parts of Florida; but they evidently did not then distinguish them as different kinds. Indeed, it was not until the end of the last century that the differences between the species were clearly interpreted and it

William Bartram (1739–1823) had the advantage of a better education, and of association with his father's scientific work from childhood. He accompanied his father to Florida in 1765, insisted upon remaining there, and settled as a planter on the Saint John's River, where he stayed about two years. In 1772 he began the extensive journey in the Carolinas, Georgia, and Florida, reported in his published "Travels." He was a botanical artist of much enthusiasm and considerable ability.—JOHN HENDLEY BARNHART.

[1] See notes published in Journal of the New York Botanical Garden 20: 21, 29, and 30. *pl.* 224. 1919.

[2] Travels through North and South Carolina, Georgia, East and West Florida, 161.

was only quite recently that their geographic distribution was reasonably well understood.

William Baldwin,[1] writing from a settlement called Tomoko, Florida, on May 15, 1817, to a friend at the North, says: ". . . I had the gratification to find the 'wild sago,' or coontia, of the Seminoles. . . . Bow-legs, the grandson of Bartram's 'Long Warrior,' says, that 'Coontia' signifies bread plant. . . . At supper, I had the pleasure to eat the bread prepared from the large tuberous root of this plant. In the late times of difficulty many negroes, and others, were prevented from perishing with hunger by having recourse to it." The coontie or comptie, as it is now called, is still used by the Seminole Indians, and there are starch mills that have furnished the flour to manufacturers in commercial quantities for many years.

Having returned to Ocala late in the evening, we started at once for Miami by way of Jacksonville, and, in due time, reached our destination.

## A Journey to the Fern Grottoes

No sooner had we arrived at Miami than we set out on another excursion to the upper part of the peninsula nearly as far north as the Lake George region which we had left only a day or two previously. In the five days at our disposal we covered an itinerary of about nine hundred miles. Our most distant objective was Lake Tsala Apopka in Citrus County. Leaving Miami in the forenoon, in a motor car driven by John DeWinkeler, my associate in exploration, we reached Titusville in the evening, passing through the same region described in a former paper.[2] Traveling still further north, the next morning we reached New Smyrna in time to partake of a breakfast, and then started across the peninsula. After passing through the flat woods with their forests of long-leaf pines and sand-pine in the higher

[1] William Baldwin (1779–1819), a medical graduate of the University of Pennsylvania and a surgeon in the United States navy, was an enthusiastic student of the flora of the southern states. In 1805–06 he visited China, and in 1817–18, South America, but more than half of the last decade of his short life was spent in Georgia and neighboring states.—John Hendley Barnhart.

[2] Journal of the New York Botanical Garden 20: 191–207. 1919.

Western Shore of Lake George, about midway north and south, December, 1918. This body of water, about fifteen miles long and eight miles wide is part of the St. Johns River. The hammock in the background was evidently a camping place of the Florida aborigines, and doubtless also of the Seminoles. There, too, the Bartrams may have camped during their exploring excursions up and down the St. Johns. Notice the shadow of a passing cloud in the foreground

parts, and the black-pine in the low parts, and all interrupted with streams and hammocks, we came to the lake region. We first stopped at Sanford where we called on the local botanist, Severein Rapp[1] who is well known through his widely distributed collections of mosses, hepatics, and lichens. Thence we passed on to Winter Park, where we met Mary Francis Baker[2] (Mrs. Thomas R. Baker), who is now specializing on the local flora and on plant photography. Our last stop in the lake region was at Orlando where we called on Cameron Mann,[3] Episcopal Bishop of Southern Florida, and also a botanist. Dr. Mann's residence is surrounded by trees and shrubs planted many years ago. The two more conspicuous specimens are a giant camphor tree and a very large *Pterospermum*. The latter-named tree was frozen to the ground two years ago; but today it is over thirty feet tall. At Orlando we obtained final instructions for reaching our immediate objective—Inverness, which is situated on the western coast of the peninsula.

We had good roads for many miles west of Orlando, but they began to fail us about sundown, and it was dark when we reached Bushnell. There we partook of our first regular meal since leaving Miami, and then set out for Inverness. As the uncertainty of the road was intensified by the darkness of a cloudy night, we took the precaution of asking a half dozen individuals the nearest way to Istachatta, where we expected to turn

[1] Severn Rapp was born in Schramberg, Würtemberg, September 6, 1853; came to America in 1883, and in the following year settled at Sanford, Florida, where he still resides; was a shoemaker until his retirement in 1911; became interested in botany about 1907, and has become well known as a plant collector, in recent years devoting his attention particularly to cryptogams, several of which bear his name. —JOHN HENDLEY BARNHART.

[2] Mary Evans Francis was born at Plainfield, Connecticut, November 29, 1876, and made her home there until 1917, when she removed to Florida; in 1918 she married Thomas Rakestraw Baker, Ph. D. (1837– ), of Winter Park, who was for many years a college professor of natural science in Pennsylvania and Florida. Mrs. Baker is the author of a "Book of Grasses," published in 1912.—JOHN HENDLEY BARNHART.

[3] Cameron Mann was born in New York City, April 3, 1851; is a graduate of Hobart College and the General Theological Seminary, and has received the degree of S. T. D. from both institutions; has been an Episcopalian clergyman since 1873, and bishop since 1901. He has been Bishop of Southern Florida, with his episcopal residence at Orlando, since October, 1913.—JOHN HENDLEY BARNHART.

north to reach our destination. We received definite and non-contradictory information, the gist of which was without exception, to take the left hand road at each fork, which was definitely identifiable in some way. All went well and all localities tallied with our information, strange to say, until we passed near the site of Dade's massacre. Here during the Seminole War only a single man of the entire command, and a wounded one at that, escaped. This seems to be an unlucky spot, for here we came upon a stream and a bridge, and also a fork in the road on the western side, all of which had been left out of our instructions. As it happened, this was the only fork where we should have taken the right hand road instead of the left. After we had gone several miles into the sand-hills we realized that we were on the wrong trail, as the road continued to bear off too far to the southwest. The geological formation had changed at about the point where we took the wrong trail. The country now became quite hilly and more sandy, and was apparently uninhabited. Although we realized our mistake, we decided to continue and await developments. Finally we reached the Withlacoochee River, crossed it and found ourselves at Croom about half way up the road to Inverness, this without having been arrested by the county officials, although, perhaps, under suspicion as blockade runners as illegal transporters of spirituous liquor are known in those parts.

Early the following morning we retraced our course of the previous night as far as Pineola, where we left the main road and turned east into the pine woods toward the Withlacoochee River about a mile distant. After a slight drop in altitude we came upon a natural flower garden. Although it was nearly mid-December, horse-mint (*Monarda*), yellow-jessamine (*Gelsemium*), yellow-buttons (*Actinospermum*), goldenrod (*Solidago*), and several asters (*Aster*) were in full bloom. After another slight decline, we found ourselves on the edge of a veritable natural amphitheatre, surrounding a cypress swamp. On entering the theatre through the rocky walls we found ourselves among boulders, chasms, cañons, natural bridges, and caves of eroded limestone. Everything was partly or completely covered with

a growth of at least a dozen different kinds of ferns, which varied from the delicate lace-like kinds to rather coarse ones. An enchanting grove of both coniferous and broad-leaved trees overshadowed the grotto, altogether a grove and a grotto that would have been a delight to the devotees of the worship of Baal; but this sanctuary had already been profaned.

The trees of the hammock association are mainly deciduous. Most common among them are iron-wood (*Carpinus*), oak (*Quercus*), elm (*Ulmus*), sugarberry (*Celtis*), mulberry (*Morus*), red-gum (*Liquidambar*), ash-leaved maple (*Negundo*), and dog-wood (*Cynoxylon*). Among the larger trees the live-oak (*Quercus virginiana*), a fruit-bearer, is evergreen, as the common name indicates, the other, the bald-cypress (*Taxodium distichum*), a cone-bearer, is deciduous-leaved. These two trees are the giants. The cypress predominates in the swampy parts, growing with clean, stout shafts rising high above the variously buttressed bases. Gigantic "knees" were present, apparently larger in the more rocky places where these stout concrete-like cones sometimes rise higher than one's head. The giant of the higher rocky places is the live-oak, standing directly on large rocks with monument-like shafts sometimes clear of branches for over fifty feet. One tree we measured had a trunk diameter of nearly six feet eight inches about four feet above the ground!

Conspicuous at that season, and ubiquitous, were two members of the nettle family and the mallow family. The former (*Urtica chamaedryoides*) had numerous inconspicuous flowers, while the latter (*Pavonia spinifex*) bore fewer but larger and showy yellow flowers. Both these plants are armed; but for different purposes, the nettle with stinging hairs for defence and the mallow with fang-like carpels with barbed awns for dissemination. No plants within the grotto are like those in the surrounding pinewoods, even the palms are different. The common saw-palmetto (*Serenoa*) inhabits the pine woods; while the palm of the grottoes is the rarer needle-palm (*Rhaphidophyllum*).[1]

The fern history[2] of this and neighboring grottoes dates from

[1] See Journal of the New York Botanical Garden **19**: 69 77. 1918.

[2] For a detailed account of the history of these ferneries see R. M. Harper, American Fern Journal **5**: 68–81. 1916.

1881, when A. H. Curtiss,[1] having learned of their existence in some way not recorded, made a pilgrimage to them from Gainesville. Two years later John Donnell Smith[2] went to the same region and found some kinds of ferns that were not represented in the Curtiss collection. Nearly a decade elapsed before the grottoes were again visited. Since that time, however, a number of fern students and plant collectors had been there.

Up to the time of our visit the total number of ferns discovered in this grotto was twelve. We found all the species previously reported and two additional ones which are indicated by small capital letters in the following list. They are:

| | |
|---|---|
| POLYPODIUM PECTINATUM | *Asplenium heterochroum* |
| *Polypodium polypodioides* | ASPLENIUM PLATYNEURON |
| *Polypodium Plumula* | *Asplenium verecundum* |
| *Pteris cretica* | *Tectaria heraclifolia* |
| *Adiantum tenerum* | *Dryopteris floridana* |
| *Asplenium abscissum* | *Dryopteris normalis* |
| *Asplenium Curtissii* | *Dryopteris reptans* |

Such a concentrated growth of ferns we have never seen anywhere else. Boulders and cliffs were entirely hidden from view by dense masses of the various species growing intimately mixed. On other overhanging rocks with rather smooth faces

[1] Allen Hiram Curtiss (1845–1907) was a native of Oswego County, New York. In his youth the family removed to Virginia, and it was in this state that he began to collect plants for distribution. In 1875 he settled in Florida, where he lived for the remainder of his life. For many years he was a professional collector, always gathering if possible a considerable supply of each plant, and his specimens, with printed labels, are to be found in nearly all the large herbaria of the world. He was the discoverer of many of the plants of southern Florida. During the last five years of his life he extended his activities to parts of the West Indies.—JOHN HENDLEY BARNHART.

[2] John Donnell Smith was born June 5, 1829, in Baltimore, Maryland, which has always been his home. After graduation at Yale, he studied law, and was admitted to the bar. During the latter part of the Civil War he was a captain in the Confederate Army. For many years he has devoted much of his time to the study of the flora of Central America, and through his persistent efforts thousands of specimens illustrative of this flora, including many collected by himself during the years 1889–96, have found their way into various important herbaria. He collected in peninsular Florida repeatedly in 1877 and following years; as early as 1878 he explored the Caloosahatchee in company with the bryologist Coe Finch Austin (1831–1880).—JOHN HENDLEY BARNHART.

the plants were scattered. Most of the kinds grow not only on the perpendicular faces of the rocks, but also on the top of boulders and all more or less horizontal surfaces. The masses of leaves of various sizes and kinds of ferns often completely hide numerous pitfalls of various sizes and ranging from a few feet to twelve feet deep. Walking is rendered exceedingly dangerous from these pitfalls alone, not to mention the soft and crumbling edges of cliffs and ledges.

The resurrection-fern (*Polypodium polypodioides*) was the only truly epiphytic fern. The two wood-ferns (*Dryopteris floridana* and *D. normalis*) often grow in colonies; while the walking-fern (*Dryopteris replans*) and the other kinds mentioned above occur thoroughly intermixed. One can often grasp a half dozen different kinds with one hand!

After nature has built and adorned this grotto beyond the power of words to describe, man has recently started the task of utterly destroying it. Although limestone rock is thereabouts in unlimited supply, a mill[1] placed at the edge of the grotto is grinding the limestone into powder to be sold for the purpose of liming cultivated fields!

After we had looked over the larger part of this great amphitheatre we returned to Pineola and located a series of caves further north between the road and the river. There we found less surface weathering and more subterranean erosion. Quite extensive caves enabled us to walk about some ten to fifteen feet beneath the surface of the ground. Only near the openings of the caverns did we find ferns and then in less abundance both as regard to kinds and quantity than at the first-visited locality. There, in the bottom of one of the larger pits, two very interesting herbaceous flowering plants covered nearly all the rocks: the one, a peculiar grass (*Pharus latifolia*), had greatly elongate fibrous roots, broad leaves, not suggestive of a grass, and more peculiarly large panicles of fruits. The fruits are viscid and fugaceous, and after one has handled a plant he finds most of the fruit adhering to his clothing. This grass was only once previously collected in Florida, nearly a century ago during the

[1] See also R. M. Harper, Natural History **19**: 201. 1919.

Indian Wars. The mature plants in leafage resemble some kinds of seedling palms. The other plant was a *Peperomia*, of a species first collected in eastern Florida in the early part of the last century and brought to light only a few times since. It is the only one of our four species of *Peperomia* now found in Florida that does not also grow in the West Indies.

Toward sunset we left the fern-grottoes and started for Brooksville. En route, shortly after leaving Floral City, we passed over some sand hills with a north and south axis. After crossing another range of hills toward the west, we turned south, and, soon running into a heavy rain-storm that lasted with more or less severity for about twenty-four hours, we reached Brooksville with our outfit pretty well soaked. Although it was dark, we continued through the town and called at the Plant Introduction Garden of the United States Department of Agriculture, a few miles southeast of the city limits.

*(To be continued.)*

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## THE WILD PIMENTO OF JAMAICA

The region known as Peckham Woods in Upper Clarendon Parish, Jamaica, has yielded many plants new to science through the collections made there by Mr. William Harris, Government Botanist and Superintendent of Public Gardens. Among these novelties perhaps the most interesting is the tree there known as "Wild Pimento," and which grows on limestone rocks. As the name implies, it is a relative of Pimenta or Allspice, *Pimenta Pimenta* (L.) Cockerell, widely distributed in Jamaica, although it is more closely related to the tree which yields oil of bay, the bay tree or bay rum tree of Porto Rico and the Lesser Antilles, *Amomis caryophyllata* (Jacq.) Krug & Urban. Like this it has 5-parted flowers, while those of *Pimenta* are 4-parted; its foliage and fruit are also more like those of *Amomis*, while the volatile oil which pervades the plant is different from that of either

relative. *Amomis caryophyllata* runs into a number of slightly different races in its long range through the islands from Porto Rico to Tortola and Trinidad, but none of them known to us approach very closely the Jamaica tree here discussed.

**Amomis jamaicensis** Britton & Harris, sp. nov.

A tree up to 13 m. high, with a trunk sometimes 3 dm. in diameter, glabrous throughout, the twigs terete, rather stout. Leaves elliptic or obovate-elliptic, thick-coriaceous, 5–9 cm. long, dull, nearly equally green on both sides, pinnately veined, not strongly reticulate, rounded at the apex, narrowed, obtuse or rounded at the base, the midvein impressed above, elevated beneath, the stout petioles 1.5 cm. long or less; inflorescence several-many-flowered, 5–8 cm. broad, its branches stout, fruits sessile or nearly so, ellipsoid, 8–10 mm. long, the 5 small sepals persistent on the ripening ovary; seeds 2; radicles much longer than the cotyledons.

Peckham Woods, Upper Clarendon, Jamaica (*Harris 12876, type; 12788*).

N. L. Britton

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## ORGANIZATION OF THE AMERICAN IRIS SOCIETY

The steadily increasing interest throughout the country in the cultivation and breeding of Iris resulted in the organization of The American Iris Society at the New York Botanical Garden January 29, 1920. A desire for such a society had frequently been expressed in the past, and definite suggestions appeared in The Garden Magazine late in 1919. Mr. John C. Wister, of Germantown, Pa., had already formulated tentative plans for organization before he joined the military service, and after his return in 1919 he began active preparations. In these he was aided by several iris specialists throughout the country and was also given material assistance by the officers of the New York Botanical Garden.

Sixty-four persons appeared at the initial meeting, in spite of

many discouraging circumstances, and letters from others at greater distances increased the list of charter members to over 150, representing all parts of the country from Maine to California. Mr. James Boyd, of Philadelphia, presided at the meeting, which was held in the Mansion. Luncheon was served at one o'clock, and by the close of the afternoon session the society was well organized and ready to begin active work. The officers are John C. Wister, president; Robert S. Sturtevant, Wellesley Farms, Mass., secretary, and Frank M. Presby, Montclair, N. J., treasurer. The next meeting of the society will be held during the iris season, probably at Philadelphia.

The plans for the new society include research into the history of iris breeding and the parentage of the numerous horticultural varieties, the standardization of iris descriptions, the registration of iris varieties, with the elimination of duplicate names, investigation of iris pests and diseases, the promotion of general interest in iris cultivation, and the establishment in suitable cities of test and exhibition gardens. In the latter connection the proposed development of an extensive iris collection at the New York Botanical Garden is of especial interest.

Few plants offer such a reward to the gardener or such interesting possibilities to the experimenter as iris. Few plants are as easily cultivated or adapted to as wide a range of soil and climate. The enthusiastic organization meeting and the large membership list indicate at once the widespread interest in the plant, and the society will undoubtedly do for iris what similar societies have already accomplished for the rose, the peony, the gladiolus, and the dahlia.

H. A. GLEASON

## CONFERENCE NOTES FOR JANUARY

The January conference of the Scientific Staff and Registered Students of the Garden was held in the laboratory of the museum building, Wednesday, January 7, 1920, at 3:30 P.M. The program for this conference was as follows: "Some sidelights on the so-called 'International Rules of Nomenclature'" by Dr. J. H. Barnhart.

Dr. Barnhart referred briefly to the early rules for nomenclature formulated by Linnaeus, Rafinesque, and other writers; to the long series of international botanical congresses, beginning with that at Amsterdam in 1865, and closing with the "first," "second," and "third" of the numbered series, at Paris in 1900, Vienna in 1905, and Brussels in 1910; and to the codes of nomenclature adopted at Paris in 1867 and at Vienna in 1905. He dwelt in more detail upon the organization of the Vienna congress; the fact that the German delegates voted as a unit, accepting Engler's word as law, and controlled absolutely every vote, first securing the adoption of an innocent-looking set of rules of order which provided for the decision of every question by a mere majority vote; and the further fact that a number of important questions were actually so decided, the decisions thus carrying little weight with anyone familiar with the methods pursued by the congress. He mentioned the peculiar continental conservatism manifested by the congress at Brussels; the prevalent sentiment that a question once decided at one of the series of congresses was settled for all time, and not subject to reconsideration at a subsequent congress; and the consequent failure of the Brussels congress to review any of the acts of the Vienna congress, in spite of the fact that there were nearly as many delegates (79 vs. 89) and votes (191 vs. 212), that more nations were represented, and that there was a much more even distribution of the voting power. In conclusion he called attention to the fact that although these meetings have long been called "congresses," the word "conference" would better express, in English, their true function; delegates attend them to present adequately the views of their constituents, and by their votes to

place those views on record; for his own part he had never considered himself in any way "bound" by the acts of these "congresses" because of his participation in them, and he believed that this was the view adopted by most if not all of the other delegates.

A. B. STOUT,
*Secretary of the Conference*

## NOTES, NEWS AND COMMENT

D. N. L. Britton, Mrs. Britton, and Miss Dorothy Coker sailed February 16 for Port of Spain, Trinidad, where they will spend two months in the botanical exploration of the island. Besides a collection of herbarium specimens, Dr. Britton hopes to secure specimens of living orchids for cultivation in the new orchids greenhouse, recently completed at Conservatory Range 2.

The following visiting scientists have recently registered in the library: Dr. Roland M. Harper, College Point, N. Y., Professor K. M. Wiegand, Ithaca, N. Y., Professor Alexander W. Evans, New Haven, Conn., Mr. Miles de Wachenfelt, Stockholm, Sweden, Miss C. C. Haynes, Highlands, N. J., Prof. G. M. Smith, Madison, Wis., Dr. A. F. Blakeslee, Cold Spring Harbor, and Dr. J. N. Rose, Washington, D. C.

Dr. H. S. Jackson, of the Purdue University Agricultural Experiment Station, spent a week at the garden recently studying the literature of the Uredineae.

Dr. W. T. Swingle, of the Bureau of Plant Industry at Washington, was a recent visitor at the Garden.

Special instruction in practical gardening has been given during the winter months to a class of women. The class has been under the supervision of Mr. K. R. Boynton, supervisor of garden instruction, and Mr. Walter Balch, and has included various phases of plant propagation, pruning, and greenhouse and garden practice.

Work is steadily progressing on the construction of new concrete benches in the greenhouses. The benches are of the same design as those previously installed in Range 1 and are a great improvement over the old benches of wood or slate and steel originally used.

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On January 22, the biology pupils of Evander Childs High School paid their semi-annual visit to the Garden, inspecting the conservatory and museum collections under the guidance of their own teachers and members of the Garden staff, and attending a lecture on the subject of forestry given in the museum lecture hall by Mr. George E. Hewitt with slides loaned by the American Museum of Natural History.

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The Nature-Study and Garden organizations of the City, about thirty in number, were represented at a meeting held on January 9 at 500 Park Avenue to take preliminary steps toward the publication of a "Guide to Nature-Study and Garden Opportunities in the Greater City." Mr. Van Eyrie Kilpatrick was elected Editor-in-Chief and he is to have an Editorial Advisory Committee made up of one representative from each organization. The cost of publication will be borne by the School Garden Association.

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*Meteorology for December.*—The total precipitation for the month was 2.79 inches of which 0.80 inches (8 inches snow measurement) fell as snow. The maximum temperatures recorded at the Garden for each week were 49° on the 7th, *59° on the 15th*, 34° on the 20th, and 49° on the 23d. The minimum temperatures were 13° on the 4th, 17° on the 15th, *−4° on the 18th*, and 12° on the 26th.

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*Meteorology for the year 1919.*—The total precipitation at the New York Botanical Garden for the year was 37.82 inches. This was distributed by months as follows: January, 3.21 inches (including a very light fall of snow, about ½ inch by snow measurement); February, 2.80 (including 1 and ¼ inch by snow measurement); March, 4.15 (including 4½ inches snow measure-

ment) April, 2.80; May, 4.05; June, 1.14; July, 4.44; August, 4.13; September, 2.85; October, 2.65; November, 2.81; December 2.79 (including 8 inches snow measurement).

The maximum temperature for the year was 100° on the 4th and 5th of July. The minimum was −4° on December 18th. The first hard killing frost of the autumn was on the morning of November 10th.

## ACCESSIONS

20 specimens of *Calostoma lutescens* from Pennsylvania. (By exchange with Professor J. F. Adams.)

15 specimens of fungi from Buck Hill Falls, Pennsylvania. (By exchange with Mrs. John Ross Delafield.)

2 specimens of fungi from Ontario. (By exchange with Professor John Dearness.)

1 specimen of *Coltricia tomentosa* from New York. (By exchange with Dr. Howard J. Banker.)

1 specimen of *Clitocybe multiceps* from Canada. (By exchange with Professor J. H. Faull.)

2 specimens of fungi from New York Botanical Garden. (By exchange with Mr. F. F. von Wilmowsky.)

1 specimen of *Anthurus borealis* from New York Botanical Garden. (Collected by Mr. Kenneth Boynton.)

12 specimens of fungi from New York. (Collected by Dr. W. A. Murrill and Mr. H. I. Miller.)

1 specimen of *Bjerkandera fumosa* from Amherst, Massachusetts. (By exchange with Professor P. J. Anderson.)

1 specimen of *Pleurotus ostreatus* from Salt Lake City, Utah. (By exchange with Mr. A. O. Garrett.)

1 specimen of *Ganoderma sulcatum* from South Carolina. (Collected by Dr. F. W. Pennell.)

1 specimen of *Coprinus micaceus* from Utah. (By exchange with Mr. A. O. Garrett.)

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EDITOR

H. A. GLEASON

*Assistant Director*


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In low part of fern grotto near Pineola, Florida, December, 1918. Lower elevations are characterized by the presence of larger, often gigantic cypress trees with their accompanying "knees" in the foreground. Broad leaved trees are absent or in the minority. In the background is an irregular mass of limestone, evidently much broader than that which has been eroded away from around it. On this rock a dozen different kinds of ferns grow closely crowded together

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# OF GROTTOES AND ANCIENT DUNES

WITH PLATES 243 AND 244

*(Continued)*

Early in the morning we decided to make Arcadia, in latitude over one hundred miles south, our objective for that day. The distance covered was close to two hundred miles, as the road zigzaged most of the way and led us through six different counties. Brooksville is situated on an elevation between the Annuttalagga Hammock in the north and the Choocochatte Hammock in the south. The growth of the latter hammock consists mostly of oak, hickory, red-gum, holly, maple, and numerous smaller trees and shrubs. The wood-fern (*Dryopteris*) was abundant on the ground, while the resurrection-fern (*Polypodium*) inhabited many of the rough-barked tree trunks. After passing by the hammock we began to climb hills. We were then on the western side of the southern extension of the series of hills already mentioned. These ridges seem out of place in peninsular Florida. In crossing them one can look from the top of one ridge across a valley to another ridge and imagine he is looking on some of the ranges of the Appalachian mountain system, although the hills are only slightly over 200 feet high, or perhaps less.

After we had crossed the eastern ridges, the country became slightly undulating, and as we proceeded southward it became

more and more flat. Upon reaching Dade City we turned southward en route to Plant City. About midway between these points we stopped long enough at an enticing spot along the Itchepuckesassa River to collect from the abundance of mosses and hepatics, fresh and conspicuous on account of the rain, that clothed the tree-trunks and old stumps in the river-swamp.

In going eastward from Plant City, before turning southward again, we came to the edge of the lake region which we had left behind about midway between Orlando and Inverness. At Bartow we turned southward and soon entered the South Florida flatwoods and prairie region. Instead of a lake region we had entered a creek and river region. There arise Alafia River, Little Manatee River, Manatee River and Myakka River, most of whose drainage basins slope westward. The longest stream and the one with the largest drainage basin is Pease River or Peace Creek. Creek and river are used more or less interchangeably in that region. Among the named feeders or tributaries of Pease River, which rises in the edge of the lake region, are Saddle Creek, Bowlegs Creek, Whidden Creek, Little Paines Creek, Big Paines Creek, Little Charlie Apopka Creek, Charlie Apopka Creek, Joshua Creek, Chilloocahatchee River, and Prairie Creek, and their tributaries, as well as numerous unmapped and unnamed streams.

At Bartow we entered the drainage basin of Pease River and followed it down as far as Arcadia. In the upper part were vast truck farms somewhat similar to those of the St. John's bottoms near Sanford. Often hundreds of acres, as far as the eye could see, were planted with a single kind of vegetable, particularly cabbage. The numerous hammocks along the way offered tempting collecting places. Plants with white, yellow, and blue or purple flowers were in abundance, although it was winter, but the short twilight and following darkness soon put a stop to collecting.

Darkness, moreover, came on before we were one third of the way down the river valley. We passed Fort Meade just after dark. Somewhere near there is the only locality in the United States where a peculiar fern of tropical America, *Dryopteris*

*panamensis*. has been found. It was discovered there in 1881 and has not been collected since.

As the twilight passed, the drizzle of the day turned into a heavy rain, which continued until we drove into Arcadia.

While walking about the town that evening and early the following morning we found the common cultivated bird-pepper (*Capsicum frutescens*) and an acanthus-relative (*Strobilanthus isophyllus*), both naturalized about the vacant lots and on roadsides.

Leaving Arcadia as soon as we could get breakfast, we decided on Miami as our next objective. Miami is distant from Arcadia over one hundred and forty miles in a direct line; but fully twice that distance by the shortest route. By putting in a full day's work—twenty four hours—stopping only a half hour for a little subsistence and devoting only short periods to collecting and photographing, we made our schedule almost to the minute.

We retraced our course of the preceding evening as far as the crossing of Pease River, passing through open pine woods and prairies, with some hammocks along streams and in low places. In the pinelands and on the prairies the saw-palmetto was blooming and often filled the air with the fragrance of its myriads of blossoms.

Leaving Pease River to the westward at Wauchula, we headed for the settlement of Avon Park. The earlier part of the route lay through low flat woods with pitcher-plants, milk-worts, ludwigias, and bladderworts in abundance. The pitcher-plant (*Sarracenia minor*) was the most interesting discovery, as no kind of *Sarracenia* had previously been found south of Kissimmee. It was most abundant in the low pinelands a few miles east of Wauchula and Zolfo Springs. As we approached the headwaters of Charlie Apopka Creek, which occupy a slough midway between Pease River and a chain of lakes eastward, hammocks came into view and we passed through extensive areas of hardwood growth and still more extensive areas of wrecked hammocks. In these the skeletons of thousands of large live-oak trees stood out as so many fantastic ghosts, and, instead of being surrounded with their normal associates of herbaceous and shrubby growth, had nothing but coarse weeds about them.

Eastward of Charlie Apopka Creek, we again approached the lake region, meeting first a prairie-like condition of the "scrub." There the prickly-pear (*Opuntia ammophila*), previously found near Lake George, appeared in abundance, but in stunted form, usually not over four feet tall, but true in all its characters. As we neared the chain of lakes of which Lake Istokpoga and several satellites form the southern outpost, the "scrub" began to appear as elevations that almost simulated active dunes. From Avon Park south to Sebring the rolling dunes of snowy sand with lakes and lakelets in their depressions were veritable winter flower gardens. These flowers held sway just as did the ferns at Inverness. The *Garberia* which we met with in the "scrub" west of Lake George during the previous week, reappeared. This composite shrub, endemic in peninsular Florida, is said to be exceptionally handsome when in flower. It is conspicuous all winter when in fruit on account of the very numerous tufts of brown pappus persistent in the involucres. The "scrub" prickly-pear was there with its purple fruits. The most conspicuous plant in bloom was a member of the knotweed family, *Thysanella robusta*. This seems to be primarily a winter bloomer. Individual plants form clumps mostly two to four feet in diameter, each with numerous feathery plumes of myriads of white flowers.

In addition to the *Thysanella*, other mat-like plants or ground-covers were in abundance in places reasonably free from fire, two of these being particularly conspicuous. One, a relative of our common carpet-weed, *Anychiastrum herniarioides*, formed closely depressed[1] mats completely covering the sand, but fragile at maturity and acting as a tumble-weed when dead. Rather more conspicuous was another member of the knotweed family, an apparently new kind of knotweed related to *Polygonella*. The plants of this shrub formed mats three to eight feet in diameter, the tough woody branches ascending only at the tips were very copiously foliaceous with small clavate leaves, but unfortunately neither flowers nor fruits were present. The most dainty flower of the region was the *Conradina*. This mint-

[1] It is said usually to be somewhat assurgent.

In fern grotto near Pineola, Florida, December, 1918. Perpendicular side of a cañon with the eroded rock covered with ferns. At least six different kinds of ferns may be distinguished. The more prominent lace-like leaf represents a species only known from that part of Florida. It is *Asplenium Curtissii*, named for the first botanist who visited the Pineola grottoes in 1881

relative grew with wand-like branches several feet tall, each bearing several of the delicate magenta and spotted corollas.

Finally Sebring was reached, where a half hour was devoted to taking subsistence, the only stop for that purpose during the day.

We were soon on our way eastward. Outside of Sebring we "negotiated" some sand-hills with difficulty, but soon came into the flat woods. Finally the right of way, cut through the pine woods, faded into nothingness in the distance. We could not understand the phenomenon until we had almost gotten out of the woods. The optical illusion was caused by looking out on an immense prairie. We had not expected to meet such an extensive prairie, but there it was, flanked with pine woods and hammock islands, all of which was soon lost to view, because of the speed of our travel, leaving almost nothing in sight except saw-palmetto and various low herbs, and sky. We were now north of Lake Istokpogo and nearing the Kissimmee River. These prairies evidently represent a northwestward extension of the Everglades and the Okeechobee basin with the Kissimmee River meandering through the lower parts.

We crossed Arbuckle Creek, drove around to the southeast and ran between Lake Istokpoga and the Kissimmee River. There the prairie became dotted with hammocks and cypress-heads of various sizes.

Lake Istokpoga, like Lake Okeechobee, has several feeders, but only one outlet.[1] This stream runs eastward and empties into the Kissimmee River. Just before crossing Istokpoga Creek our car bogged in a wet spot in the prairie and an hour was consumed in digging it out. Although the sun was just about setting we managed to photograph this stream. It is bordered by beautiful hammocks which are made up of oaks and maples among other deciduous trees, and the live-oak copiously draped with Spanish-moss. Shrubs were numerous and the southern-elder (*Sambucus intermedia*) formed dense thickets. In the

[1] Of course, only the natural outlets are referred to here. No less than five water-highways now connect Lake Okeechobee with the eastern coastal region, and a large canal planned to connect Lake Istokpoga with Lake Okeechobee is under construction.

stream itself were spatter-docks (*Nymphaea*), water-lilies (*Castalia*), and maiden-cane (*Panicum hemitomon*).

We reached the Kissimmee River about twilight, just too late to use the two photographic plates we had been saving for use there. Thus far the Kissimmee had eluded our camera. We were now in the old flood plain of the Kissimmee which resembles that of the Saint John's River further north, but it is uncultivated, being now, as for many years past, devoted to pasturage.

Although peninsular Florida is relatively flat and often apparently monotonous, the topography has not yet been well worked out. One very interesting point that impressed itself on us during this excursion was the fact that the watershed of the Saint John's River on the east overlaps that of the Kissimmee on the west. The divide seems to be the ridge of old sand-dunes that runs from west of Lake George southward, skirting the coast region east of Lake Okeechobee and southward along the rim of the Everglades. Curiously enough, the chain of lakes of the Saint John's basin has received English names, while those of the Kissimmee basin have maintained the names given them by the Indians.

We crossed the Kissimmee River just above the site of Fort Bassinger. For several miles on the eastern side of the River the trail is elevated on an embankment over the river flats. There we narrowly escaped running into a bridgeless culvert and were saved only by the bright light of the full moon. We were not long in reaching the settlement of Bassinger and a short distance beyond it brought us out on the prairie region north of Lake Okeechobee. The full moon was as bright as only a Florida moon can be. We found a trail leading to the southeast and headed for Okeechobee City, which has swallowed up both the name and the site of Tantie and is situated on the Onothohatchee or Taylor's Creek about three miles from Lake Okeechobee.

When we had gone only a short distance from Bassinger the timer of our motor broke down, but the moonlight was so bright that we mended it without using our electric lamp. Once more on the trail we sped along, going in all directions of the compass

in order to dodge sloughs and ponds, but whichever way we turned the trail always brought us back to the southeast. The flora of this prairie has never been collected, unless to a slight extent by the surgeons of the military forces that were on it during the Seminole Wars, and now circumstances brought the writer there at night.

Animal life was more conspicuous on the prairie at night than were plants. Various quadrupeds and numerous birds scattered as we approached them.

Not a sign of civilization came to view until we saw the lights of Okeechobee City in the distance. We were now approaching country we had traversed before. We did not stop at Okeechobee City, but continued our journey and headed for Fort Pierce.

We had looked forward to smooth riding from Okeechobee to Miami; but we were sorely disappointed and had it forcibly impressed upon us that destruction in Florida is not confined alone to things natural, but also to things *material*. Twenty-four of the thirty-six miles of the road from Okeechobee City to Fort Pierce were about perfect when we traveled it a year and a half before. This night it was a wreck, simply from use and lack of a little care. We cannot recall a more uncomfortable ride than that one and we did not get into Fort Pierce until midnight or in eighteen hours traveling time from Arcadia. Miami was our objective, as already stated, and we decided to make it by six o'clock in the morning.

The main question was how to keep awake on the last quarter of the twenty-four hour drive. Mr. DeWinkeler agreed to drive until we reached Miami if the writer would keep him awake. This plan agreed to, we called caffeine to our assistance and each of us partook of three large cups of black coffee, and then started on our final one hundred and thirty mile drive. South of Fort Pierce the timer of the motor began to show signs of failing, and about the time we reached a hammock a few miles south of the town it failed completely. In the end, it was fortunate that it broke down there, as we wanted several plants from the hammock. While the timer was being repaired, a second

time by moonlight, the writer hunted the hammock for the desired plants, with the aid of the flash-light we had been saving for just such an occasion, and secured them without, incidentally, picking up a rattle-snake or coralsnake.

The plant particularly wanted was a little *Peperomia* referred to in a previous paper.[1] Especial interest in it had developed since the earlier excursion, on account of the close relative found in the caves near Pineola described above. Investigation showed that the plant from the Pineola caves is the same as the *Peperomia* first found in the United States in eastern Florida in the earlier part of the last century, and mentioned above. The week before our discovery of it near the western coast, Charles T. Simpson and John Soar found it growing en masse on shell mounds south of Daytona on the eastern coast. Otherwise, for a hundred years, it was known only from the shell mounds near the mouth of the Saint John's River. It is endemic in Florida.

The little plant from the hammock south of Fort Pierce turns out to be the same as the one we collected in Snake Hammock near Coot Bay back of Flamingo, Cape Sable, in the spring of 1917, and it also represents a West Indian species not heretofore credited to the flora of the United States. Recent exploration has added two species of *Peperomia* to the flora of the United States, and we now have four species, representing three groups of the genus, instead of two species, or one representing each of two groups.

We traveled on over the high sand-dunes in the vicinity of Hobe Sound and Jupiter, and shortly came into view of West Palm Beach. There, the only nocturnal restaurant enabled us to indulge in three more cups of black coffee, and we reached Miami shortly after sunrise safe and sound, but, unfortunately, confronted by a full day's work on our specimens.

## Southern Everglade Region

The remaining day available for field work was devoted to territory midway between Royal Palm Hammock and Cape

[1] Journal of the New York Botanical Garden **19**: 77. 1918.

Sable. This excursion was made possible by the roadbed of the Ingraham Highway, Miami to Cape Sable, and lateral canal then under construction. We drove our car as far as the roadbed had been temporarily surfaced, and thence proceeded as far as the dredge had excavated a channel, in the motor-boat belonging to the dredge. We passed within sight of Hammer Key, where we had collected the previous spring,[1] and pressed on to hammocks of a different character, judging from our superficial examination. Their characteristic vegetation, however, is yet to be studied.

The most striking growth on the low prairie several miles southwest of Royal Plam Hammock was open stunted forests of pond-cypress trees, small, but with all the appearances of great age. At that time of the year they were leafless and stood scattered on the prairie, suggesting so many gray specters with scraggy outstretched arms.

About ten miles southwest of Royal Palm Hammock the rock changes from the Miami oölite to the Lossmans River limestone. Naturally we should find somewhat different vegetation on the latter. The most conspicuous difference in the hammocks on the Lossmans River limestone is the saw-cabbage palm (*Paurotis Wrightii*), raising its crowns above the other vegetation. This palm was maturing its fruits about the time of our visit. The numerous elongate spadices bearing myriads of berries were very conspicuous, particularly the half ripe fruits which were bright red, so brilliant that the large plumes resemble tongues of flame above the other hammock vegetation. Occasionally clumps of an almost pure growth of this palm occurred in the open Everglades.

Within the hammocks high-climbing orchids were often not only evident, but abundant. Two kinds grew there, representing two different divisions of the genus *Vanilla*. One (*Vanilla phaeantha*) had broad leaf-blades up to six inches in length. This plant was discovered in these hammocks several weeks before our visit by Mr. Charles A. Mosier, Custodian of Royal Palm Hammock. The other (*Vanilla articulata*) was in equal abundance, and is leafless. Each of these orchids had been

[1] Journal of the New York Botanical Garden **20**: 191–207. 1919.

found in Florida only once before, and both times in hammocks on the Lossmans River limestone. Another kind of vanilla (*Vanilla Eggersii*) grows naturally in Florida. However, it occurs only at two known stations, the one in the Deering Hammock in Miami, the other in the Madeira Hammock near the Bay of Florida not more than ten miles from the locality where we found the two species mentioned above.

Aside from the excursion to Pensacola, more than twelve hundred miles in the peninsula were covered both for making collections and observations. Several days were spent about Miami, Buena Vista, and Cutler in field-work. Herbarium specimens and living plants of such kinds as we particularly wished to study were gathered. We covered considerable ground never before visited by a botanist, determined the geographic range of several species more correctly, discovered several species of plants new to science, and secured a number of photographs of the fern-grottoes and caves, and of other localities that in the near future will be much devastated or destroyed.

JOHN K. SMALL.

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## SATURDAY AND SUNDAY SPRING LECTURES, 1920

Free public lectures will be delivered in the lecture hall of the museum building of the Garden on Saturday and Sunday afternoons, at four o'clock, as outlined below. Most of the lectures will be illustrated with lantern slides and the style of presentation will be simple and popular, so that the average high-school pupil should readily understand them.

The Sunday lectures are being inaugurated this spring, with the hope of reaching persons who can not be present on Saturdays. With this idea in mind, a practical lecture on growing vegetables has been arranged for each course. The flower shows in May and June will be open both on Saturday and Sunday, as heretofore.

A number of very interesting subjects will be presented in these courses; and many of the lecturers, who are prominent

and busy men, have inconvenienced themselves considerably to accept appointments. Mr. John Burroughs is expected to be present on April 24, when Dr. Fisher speaks. Mr. Beebe, on April 25, will describe and show lantern slides of the strange and wonderful things he has seen in South America. The relation of animals to plants will be discussed by two lecturers, Dr. Olive and Professor Gies. A new method of grafting has been discovered by the distinguished surgeon, Dr. Robert T. Morris, who will describe it on May 29 and give his experiences in growing nut trees. Professor Massey, of Cornell University, is an expert on rose diseases; Mr. Wister is President of the new American Iris Society;—the other lecturers are well known to our members. Mr. Carl Bannwart, of Newark, New Jersey, will close the spring course on May 30 with a lecture appropriate to Decoration Day.

### Saturday Lectures

April 17. "Vegetable Gardening," Mr. J. G. Curtis.
April 24. "With John Burroughs at Slabsides," Dr. G. C. Fisher.
May 1. "Flowers for the Home Garden," Mr. G. V. Nash.
May 8. "Plant Motives in Primitive and Egyptian Decorative Art," Dr. W. A. Murrill.
(Exhibition of Flowers, May 8 and 9.)
May 15. "Floral and Scenic Features of Chile," Mr. G. T. Hastings.
May 22. "The Dependence of Animals on Plants," Prof. W. J. Gies.
May 29. "Growing and Grafting Nut Trees," Dr. R. T. Morris.
June 5. "The Diseases of Roses," Prof. L. M. Massey.
June 12. "The History and Development of the Iris," Mr. J. C. Wister.
(Exhibition of Roses, Peonies, and Irises, June 12 and 13.)
June 19. "New York as a Center for the Amateur Botanist," Mr. Norman Taylor.
June 26. "Evergreens for American Gardens," Mr. Arthur Herrington.

SUNDAY LECTURES

April 18. "The Big Trees of California," Dr. H. A. Gleason.
April 25. "Jungle Peace," Mr. William Beebe.
May 2. "Vegetables for the Home Garden," Mr. H. Findlay.
May 9. "The Importance of Plants as Compared with Animals," Dr. E. W. Olive.
(Exhibition of Flowers, May 8 and 9.)
May 16. "Late Spring Flowers," Dr. N. L. Britton.
May 23. "Plant Motives in Greek and Early Christian Decorative Art," Dr. W. A. Murrill.
May 30. "Historic and Memorial Trees," Mr. Carl Bannwart.

W. A. MURRILL

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## HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

*(Continued)*

### OLEACEAE. Olive Family

**Forestiera ligustrina.** PRIVET FORESTIERA.
Location: Fruticetum.
Natural distribution: Southeastern United States.

### Chionanthus. FRINGE TREE

**Chionanthus virginica.** FRINGE TREE.
Location: Fruticetum.
Natural distribution: Southeastern United States.

### Ligustrum. PRIVET

**Ligustrum acuminatum.** SHARP-POINTED PRIVET.
Location: Fruticetum.
Natural distribution: Japan.

**Ligustrum acuminatum** var. **macrocarpum.** LARGE-FRUITED SHARP-POINTED PRIVET.
Location: Fruticetum.

**Ligustrum amurense.** AMUR PRIVET.
Location: Fruticetum.
Natural distribution: Amur region, China, and Japan.

**Ligustrum Ibota.** IBOTA PRIVET.
Location: Fruticetum.
Natural distribution: Japan and China.

**Ligustrum Ibota** var. **Regelianum.** REGEL'S PRIVET.
Location: Fruticetum. Lake Bridge.

**Ligustrum ovalifolium.** CALIFORNIA PRIVET.
Location: Fruticetum.
Natural distribution: Japan.

**Ligustrum ovalifolium** var. **aureo-marginatum.** GOLDEN-MARGINED PRIVET.
Location: Fruticetum.
Horticultural origin.

**Ligustrum ovalifolium** var. **elegantissimum.** ELEGANT CALIFORNIA PRIVET.
Location: Fruticetum.

**Ligustrum Quihoui.** QUIHOU'S PRIVET.
Location: Fruticetum.
Natural distribution: China.

**Ligustrum sinense** var. **Stauntonii.** STAUNTON'S CHINESE PRIVET.
Location: Fruticetum.
Natural distribution: China and Corea.

**Ligustrum vulgare.** COMMON PRIVET.
Location: Fruticetum.
Natural distribution: Europe, northern Africa, and western Asia.

**Ligustrum vulgare** var. **buxifolium.** BOX-LEAVED COMMON PRIVET.
Location: Fruticetum.
Natural distribution: Europe.

**Ligustrum vulgare** var. **sempervirens.** EVERGREEN COMMON PRIVET.
Location: Fruticetum.

## LOGANIACEAE. Logania Family

### **Buddleia.** SUMMER LILAC

**Buddleia Davidi.** SUMMER LILAC.
Location: Fruticetum.
Natural distribution: China.

**Buddleia Davidi** var. **magnifica.** CREPE SUMMER LILAC.
Location: Fruticetum.
**Buddleia Davidi** var. **superba.** BRIGHT-EYED SUMMER LILAC.
Location: Fruticetum.
**Buddleia Davidi** var. **Veitchiana.** VEITCH'S SUMMER LILAC.
Location: Fruticetum.
**Buddleia nivea** var. **yunnanensis.** YUNNAN SUMMER LILAC.
Location: Fruticetum.
Natural distribution: Southern China.

## ASCLEPIADACEAE. Milkweed Family

### **Marsdenia.** MARSDENIA

**Marsdenia erecta.** HARDY MARSDENIA.
Location: Fruticetum. .
Natural distribution: Southeastern Europe and Syria.

## VERBENACEAE. Vervain Family

### **Callicarpa.** CALLICARPA

**Callicarpa japonica.** JAPANESE CALLICARPA.
Location: Fruticetum.
Natural distribution: Japan.
**Callicarpa purpurea.** CHINESE CALLICARPA.
Location: Fruticetum.
Natural distribution: Japan and China.

### **Vitex.** CHASTE-TREE

**Vitex Agnus-castus.** CHASTE-TREE.
Location: Fruticetum.
Natural distribution: Southern Europe and western Asia.
**Vitex Negundo** var. **incisa.** CUT-LEAVED CHINESE CHASTE-TREE.
Location: Fruticetum.
Natural distribution: Northern China and Mongolia.

### **Clerodendron.** CLERODENDRON

**Clerodendron trichotomum.** KUSAGI.
Location: Fruticetum.
Natural distribution: Japan.

## SOLANACEAE. Potato Family

### **Lycium.** MATRIMONY VINE

**Lycium chinense.** CHINESE MATRIMONY VINE.
Location: Fruticetum.
Natural distribution: China.

**Lycium halimifolium.** MATRIMONY VINE.
Location: Fruticetum.
Natural distribution: China to southeastern Europe.

## SCROPHULARIACEAE. Figwort Family

### **Penstemon.** BEARD-TONGUE

**Penstemon Scouleri.** SCOULER'S BEARD-TONGUE.
Location: Fruticetum.
Natural distribution: Northwestern North America.

### **Paulownia.** PAULOWNIA

**Paulownia tomentosa.** PAULOWNIA.
Location: Arboretum. Mansion. Drinking fountain southeast of Museum.
Natural distribution: Central China.

## BIGNONIACEAE. Trumpet-creeper Family

### **Bignonia.** TRUMPET-CREEPER

**Bignonia radicans.** TRUMPET-CREEPER.
Location: Viticetum.
Natural distribution: Eastern North America.

### **Catalpa.** CATALPA

**Catalpa Catalpa** (*Catalpa bignonioides*). INDIAN BEAN.
Location: Arboretum. Harlem Depot plaza. Along road from Museum to Elevated Approach.
Natural distribution: Southeastern United States.

**Catalpa Catalpa** var. **nana.** DWARF INDIAN BEAN.
Location: Arboretum.
Horticultural origin.

**Catalpa hybrida.** HYBRID INDIAN BEAN
Location: Arboretum. Harlem Depot plaza.
Horticultural origin.

**Catalpa ovata** (*Catalpa Kaempferi*). KAEMPFER'S CATALPA.
Location: Arboretum. Herbaceous Grounds.
Natural distribution: China.

## RUBIACEAE. MADDER FAMILY

### Cephalanthus. BUTTON-BUSH

**Cephalanthus occidentalis.** BUTTON-BUSH.
Location: East end of Boulder Bridge. Wild, in wet places.
Natural distribution: Eastern North America.

## CAPRIFOLIACEAE. Honeysuckle Family

### Sambucus. ELDER

**Sambucus canadensis.** SWEET ELDER.
Location: Fruticetum. Herbaceous Grounds. Aquatic Garden. Wild, common in wet places.
Natural distribution: Eastern North America.

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## CONFERENCE NOTES FOR FEBRUARY

Professor W. A. Setchell of the Department of Botany of the University of California addressed the Conference of the Scientific Staff and Registered Students of the Garden in February on the subject "The Geographical Distribution of the Marine Spermatophytes." He reported that there are 34 or 35 well-recognized species of seed plants that live in the waters of the ocean. These belong in eight genera as follows: *Halophila*, *Enalus* and *Thalassia* of the family Hydrocharitaceae and *Zostera*, *Phyllospadix*, *Cymodocea*, *Diplanthera* (or *Halodule*) and *Posidonia* of the Potomagotenaceae.

All species of these two families are aquatic. Of the 35 species that are marine all but the three species of *Phyllospadix* live in shallow water but are so deeply submerged that they are seldom if ever uncovered by ordinary low tides.

A summary was given of the various investigations treating of the morphology, taxonomy and ecology of these plants. A special discussion was made of the temperature requirements of the various species as revealed by their geographical distribution.

This together with the data regarding these species and especially those of extensive distribution (*Halophila ovalis* and *Zostera marina*) will appear in detail in another journal in the near future. A summary of the principal points of general interest there to be presented by Professor Setchell is as follows:

"1. The marine spermatophytes are largely made up of plants surrounded by a medium whose temperature at any given time is the same for all parts of the plant. The species of *Phyllospadix* alone present to a certain extent, at least, the temperature conditions of terrestrial spermatophytes in that, at periods of low water, they have their roots in soil (or sand) of one temperature and their leaves in air of another. The majority of the marine spermatophytes live under a greater uniformity of temperature conditions than do the terrestrial spermatophytes.

"2. The marine spermatophytes live under conditions very similar to those experienced by the marine algae and show the same temperature-zone relations as the marine algae.

"3. The great majority of the species of the marine spermatophytes are confined strictly to one temperature zone of 5° C. amplitude of the monthly mean maximum of the surface waters. Such species are strictly stenothermal from every point of view and may be supposed to represent the normal type in distribution.

"4. There are certain species which extend over two zones of temperature. It seems possible in these cases, as it has also seemed possible in the cases of certain marine algae, to regard these marine spermatophytes as normal to one zone whence they invade the other because they find in certain localities of the invaded zone their proper temperature. The invasions of the marine spermatophytes, also like those of the marine algae, proceed in two directions in the cases of the two-zoned species, viz., from a warmer into a colder zone because of the existence of warmer spots among the colder areas normal to the zone—or—from a colder into a warmer zone because of a seasonal lowering of the temperature of the warmer zone or portions of it.

"5. There are a few species which are credited to more than two temperature zones and such are also found among the marine

algae. It may be that these species being normal to one temperature zone, may invade not only one zone, but two or more additional zones because of the existence of localities or seasons of suitable temperature. This movement may be in only one direction from the normal zone, as in the case of *Halophila ovalis*, or it may be in two directions from the normal zone as seems to be the case with *Zostera marina*.

"6. Finally attention may be called to the difficulties attending the study of the distribution of a species caused by the incompleteness of our knowledge of its homogeneity or the lack of it, its persistence through one or more seasons, its dependence upon spore reproduction or its ability to persist through vegetative multiplication, its seasons of flowering, fruiting, etc., in different portions of its range, any difference in habitat in different portions of its range, and any other matters which may be characteristic of the behavior of the species and which may possibly vary according to locality. The case of *Zostera marina* certainly indicates how much it is desirable to increase our knowledge of such species before we may feel certain that we are in any advantageous position to discuss the factors concerned in their very extensive distribution."

A. B. STOUT,
*Secretary of the Conference.*

## NOTES, NEWS AND COMMENT

Professor W. C. Coker, of the University of North Carolina, spent the latter part of March at the Garden consulting the mycological herbarium and the library.

Professor H. S. Jackson, of Lafayette, Indiana, spent several days at the Garden in February consulting the library and mycological herbarium in connection with monographic work on the rusts for *North American Flora*.

Dr. Alfred Rehder, of the Arnold Arboretum, visited the Garden on March 16 for the study of various woody plants.

Mr. C. H. Bissell of Southington, Conn., was a recent visitor.

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Dr. E. Mead Wilcox, for some years Professor of Botany in the University of Nebraska, called at the Garden on the 5th of March. He has since sailed for Santo Domingo where he will occupy the post of Director of the newly established Agricultural Station. The Garden is counting upon Dr. Wilcox's cooperation in its study of the island's flora.

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Professor Jacques Hadamard, Collège de France, Paris, mathematician and botanist, visited the Garden in March. He will travel to Texas to lecture on mathematics at the Rice Institute in Houston, and is expecting to make botanical collections in the Gulf States, the West Indies and Panama.

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Dr. W. A. Murrill lectured in Chicago on "Edible and Poisonous Fungi" before the Convention of the Woman's National Farm and Garden Association on the evening of March 22, and on "The Use of Plants in Design" at the Art Institute on the evening of March 23.

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An exceptionally good collection of fungi, consisting mainly of resupinate polypores, accompanied by complete field notes, has been sent in to the Garden from Toledo, Ohio, by Mr. W. R. Lowater.

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A large series of ferns and flowering plants from Mexico and Central America recently received from the National Museum is being installed and incorporated in the Garden Herbarium.

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Two valuable collections of plants from the little known Big Cypress Swamp in southern peninsular Florida has been added to the permanent collections. One is a large series of miscellaneous specimens. The other comprises about forty specimens of the medicinal plants used by the Big Cypress Seminole Indians. This is the first collection of its kind brought together.

Rev. H. M. Denslow, a member of the Torrey Botanical Club and our most experienced local student of orchids, has commenced a geographical arrangement of our specimens of North American Orchidaceae. In accord with his suggestion at a recent meeting of the Club he is indicating on outline maps for each species the states from which we have representatives.

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The attendance at the Greenhouse lectures at Range 2 was excellent in spite of the unusually severe weather conditions. Illustrating the lectures with living plants stimulated much interest and many questions were asked.

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The first class in advanced biology in the Evander Childs High School visited the Garden on March 12 to study the specimens of fungi in the Museum. Mr. George T. Hastings was in charge of the class and Dr. Seaver and Dr. Murrill gave brief talks.

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The making of new concrete benches for the Propagating House is nearly completed. These are long-needed improvements. Also a new tank is under construction.

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*Meteorology for January.*—The total precipitation for the month was 2.59½ inches of which 0.725 inches (7¼ inches snow measurement) fell as snow. The maximum temperatures for each week were 49° on the 1st, 40° on the 8th, 42° on the 13th, 35° on the 21st and *53° on the 27th.* The minimum temperatures were 5° on the 5th, 10° on the 6th, 5° on the 16th and *4° on the 20th.*

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*Meteorology for February.*—The total precipitation at the New York Botanical Garden for the month was 4.17 inches including 2.2 inches (22 inches snow measurement) of snow. The maximum temperatures for each week were *46° on the 3d, on the 11th, and on the 22d,* and 44° on the 24th. The minimum temperatures were *— 4° on the 1st,* 19° on the 9th, 8° on the 16th, 13° on the 17th and 6° on the 27th.

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Vol. 10, part 1, 1914; parts 2 and 3, 1917. Agaricaceae (pars).

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Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916; part 2, 1917; part 3, 1918. Chenopodiaceae—Allioniaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913; part 6, 1918. Podostemonaceae—Rosaceae.

Vol. 24, part 1, 1919; part 2, 1920. Fabaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 32, part 1, 1918. Rubiaceae (pars).

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

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# JOURNAL

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# The New York Botanical Garden

EDITOR

H. A. GLEASON

*Assistant Director*

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OF

# The New York Botanical Garden

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## PUBLICATIONS OF THE STAFF, SCHOLARS AND STUDENTS OF THE NEW YORK BOTANICAL GARDEN DURING THE YEAR 1919

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——— Mosses of Madagascar. Bryologist **22**: 27, 27. 15 Jl 1919. [Review.]

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## ABOUT PAULOWNIA TREES

For several years past an increasing number of young *Paulownia* trees have been observed within the New York Botanical Garden reservation, springing up in thickets and in woodlands from wind-borne seeds of the larger trees, and many of them have been cut out, a process necessary to continue; it seems desirable to somewhat decrease the number of large trees in order to reduce the nuisance; the number of seeds produced by a large tree is enormous, each of the pods containing several hundred, and pods are produced very abundantly. The seeds are small and thin, readily transported to considerable distances on the wind.

These seedling Paulownias grow very rapidly during their first few years. The tree standing near the drinking fountain southeast of the museum building, described and illustrated by Mr. Nash in Garden JOURNAL 8: 13–16, 1907, grew fourteen feet in its second season, and growths from eight to twelve feet are commonly observable. They slow down, however, after the second or third year, the individual above mentioned being now, after thirteen years' growth, about forty feet high, the average growth of a tree fourteen years old being thus about three feet, and probably not adding more than two feet to its height annually at present; its trunk circumference in November 1919 at four

feet above the ground, is forty and one-half inches, its diameter therefore not quite thirteen inches, and it has thus increased in thickness an average of a little less than one inch a year during its life. The immense *Paulownia* standing just south of the mansion was there as a very much smaller tree when that building was constructed in 1856, according to Mr. A. H. Wallace, the mason who built its walls, and who, despite his years, is a frequent visitor. Assuming that this tree was set out in 1850, it is about seventy years old; its height is approximately sixty feet and its trunk diameter is four feet one inch. In latter years it has increased in height scarcely at all, and has shown evidences of decrepitude, severe pruning of large dead branches having been necessary. It may be that this giant individual is larger than the tree ordinarily becomes in its native home in Japan, inasmuch as Professor Miyabe told us during a recent visit that he had no recollection of seeing one so large before.

Trees of two and three years old bear enormous round leaves, sometimes up to thirty inches in diameter, these being among the largest leaves produced by any tree, and very interesting. In spring, when covered with large, purple, viscid, odorous flowers, which appear before the leaves unfold, Paulownias are beautiful and conspicuous. They are often called Empress Tree.

On account of technical features of flower and fruit structure, *Paulownia* has been classified by botanists as a genus of the Figwort Family (Scrophulariaceae), to which snapdragons, calceolarias, and a great number of other herbaceous plants belong. It is aberrant in that family, however, being almost the only tree included. Recently, Dr. Francis W. Pennell of the Garden staff, who is monographing the family for *North American Flora*, has restudied the flowers and fruit in detail, from which it appears that the genus may be more rationally referable to the Bignonia Family, nearly all trees, shrubs or woody vines, to which the Catalpas belong, the last having large leaves similar to those of *Paulownia*—a relationship long ago suggested by the famous Swiss botanist, A. P. de Candolle.

N. L. Britton

# HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

*(Continued)*

## Viburnum. VIBURNUM

**Viburnum acerifolium.** DOCKMACKIE.
Location: Fruticetum. Triangle east of Museum. Herbaceous Grounds shelter. Wild, common.
Natural distribution: Northeastern North America.

**Viburnum burejaeticum.** MANCHURIAN VIBURNUM.
Location: Fruticetum.
Natural distribution: Northern China and Manchuria.

**Viburnum Carlesii.** FRAGRANT VIBURNUM.
Location: Fruticetum.
Natural distribution: Corea.

**Viburnum cassinoides.** WITHE-ROD.
Location: Fruticetum.
Natural distribution: Northeastern North America.

**Viburnum dentatum.** ARROW-WOOD.
Location: Fruticetum.
Natural distribution: Eastern North America.

**Viburnum dilatatum.** THUNBERG'S VIBURNUM.
Location: Fruticetum.
Natural distribution: China and Japan.

**Viburnum erosum.** EROSE VIBURNUM.
Location: Fruticetum.
Natural distribution: Japan.

**Viburnum hupehense.** HUPEH VIBURNUM.
Location: Fruticetum.
Natural distribution: Central China.

**Viburnum Lantana.** WAYFARING TREE.
Location: Fruticetum.
Natural distribution: Europe and western Asia.

**Viburnum Lentago.** NANNY-BERRY.
Location: Fruticetum. Wild, scarce.
Natural distribution: Eastern North America.

**Viburnum macrocephalum.** LARGE-CLUSTERED VIBURNUM.
Location: Fruticetum.
Natural distribution: China.

**Viburnum nudum.** LARGER WITHE-ROD.
Location: Fruticetum.
Natural distribution: Southeastern United States.

**Viburnum Opulus.** EUROPEAN CRANBERRY-TREE.
Location: Fruticetum.
Natural distribution: Europe, northern Africa, and northern Asia.

**Viburnum Opulus** var. **nanum.** DWARF CRANBERRY-BUSH.
Location: Fruticetum.
Horticultural origin.

**Viburnum Opulus** var. **sterile.** GUELDER ROSE.
Location: Fruticetum.

**Viburnum Opulus** var. **xanthocarpum.** YELLOW-FRUITED EUROPEAN CRANBERRY-TREE.
Location: Fruticetum.

**Viburnum prunifolium.** BLACK HAW.
Location: Fruticetum. Herbaceous Grounds. Wild, common.
Natural distribution: Eastern United States.

**Viburnum pubescens.** DOWNY-LEAVED ARROW-WOOD.
Location: Fruticetum.
Natural distribution: Eastern United States.

**Viburnum rufidulum.** SOUTHERN BLACK HAW.
Location: Fruticetum.
Natural distribution: Southeastern United States.

**Viburnum Sargentii.** CHINESE CRANBERRY-TREE.
Location: Fruticetum.
Natural distribution: Northern China and Japan.

**Viburnum Sieboldi.** SIEBOLD'S VIBURNUM.
Location: Fruticetum. East end of Long Bridge.
Natural distribution: Japan.

**Viburnum tomentosum.** WOOLLY VIBURNUM.
Location: Fruticetum.
Natural distribution: China and Japan.

**Viburnum tomentosum** var. **plenum.** JAPANESE SNOWBALL.
Location: Fruticetum.
Horticultural origin.
**Viburnum tomentosum** var. **rotundifolium.** EARLY JAPANESE SNOWBALL.
Location: Fruticetum.
**Viburnum venosum.** VEINY ARROW-WOOD.
Location: Fruticetum.
Natural distribution: Southeastern United States.
**Viburnum venosum** var. **Canbyi.** CANBY'S ARROW-WOOD.
Location: Fruticetum. Triangle east of Boulder Bridge.
Natural distribution: Delaware to Pennsylvania.

## **Symphoricarpos.** SYMPHORICARPOS

**Symphoricarpos albus** var. **laevigatus.** SMOOTH SNOWBERRY.
Location: Fruticetum. West of Museum.
Natural distribution: Northern North America.
**Symphoricarpos albus** var. **laevigatus variegatus.** VARIEGATED SMOOTH SNOWBERRY.
Location: Fruticetum.
Horticultural origin.
**Symphoricarpos occidentalis.** WOLFBERRY.
Location: Fruticetum.
Natural distribution: Western North America.
**Symphoricarpos Symphoricarpos** (*Symphoricarpos vulgaris*). CORAL-BERRY.
Location: Fruticetum. West of Museum.
Natural distribution: Eastern United States.
**Symphoricarpos Symphoricarpos** var. **variegatus.** VARIEGATED CORAL-BERRY.
Location: Fruticetum.
Horticultural origin.

## **Abelia.** ABELIA

**Abelia grandiflora.** GARDEN ABELIA.
Location: Fruticetum. Conservatory bed 9.
Hybrid.

## Lonicera. HONEYSUCKLE

**Lonicera Alberti.** ALBERT'S HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Turkestan.

**Lonicera alpigena.** MOUNTAIN HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Central and southern Europe.

**Lonicera bella.** ZABEL'S HONEYSUCKLE.
Location: Fruticetum.
Hybrid.

**Lonicera bella** var. **albida.** ZABEL'S WHITE HONEYSUCKLE.
Location: Fruticetum.

**Lonicera bella** var. **atrorosea.** ZABEL'S DARK ROSE HONEYSUCKLE.
Location: Fruticetum.

**Lonicera bella** var. **candida.** ZABEL'S SNOWY HONEYSUCKLE.
Location: Fruticetum.

**Lonicera bella** var. **rosea.** ZABEL'S ROSE HONEYSUCKLE.
Location: Fruticetum.

**Lonicera chaetocarpa.** HAIRY-FRUITED HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Western China.

**Lonicera chrysantha.** YELLOW-FLOWERED HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Northeastern Asia to central Japan.

**Lonicera chrysantha** var. **Regeliana.** REGEL'S HONEYSUCKLE.
Location: Fruticetum.

**Lonicera coerulea** var. **dependens.** TURKESTAN FLY-HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Turkestan.

**Lonicera coerulea** var. **edulis.** SIBERIAN FLY-HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Siberia and northern China.

**Lonicera coerulea** var. **Kirilovi.** KIRILOW'S FLY-HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Turkestan.

## CONFERENCE NOTES FOR MARCH

The March Conference of the Scientific Staff and Registered Students of the Garden was held on the afternoon of March 3d. The program presented was as follows:

"The flower in the genus *Hemianthus*," by Dr. F. W. Pennell.

"The genus *Peperomia* in Florida," by Dr. J. K. Small.

Dr. Pennell discussed the evolution of the flower of the genus *Hemianthus* Nutt. This genus belongs to the tribe Gratioleae of the family Scrophulariaceae and is characterized by its minute and exceedingly modified flower. The derivation of this from the normal and also the primitive types of that tribe was shown, and the peculiarities of *Hemianthus* held to illustrate four principles, (*a*) reduction in number of parts, shown in all portions of the flower; (*b*) union of parts, shown in the calyx and corolla; (*c*) tendency to increasing zygomorphy, *i.e.*, irregular but bilateral symmetry; and (*d*) various irregular and particular changes, such as may be reduced to no definite class. It was held that these last are the best criteria of more immediate relationship, and that especially the very strangely modified stamens of *Hemianthus* and its peculiarly striated seeds best tell its kinship, while the flower, altered as it is in number and union of parts, is in those respects like plants of quite remote affinity. Also it was emphasized that while parts united may again become free, as is shown by the styles of *Hemianthus*, there is never a tendency for parts that have become rudimentary or lost to reappear. The fifth stamen of *Hemianthus* as in most other of the Scrophulariaceae is permanently lost and in this genus two more of the stamens are also usually aborted.

Dr. Small reported on the Florida species of *Peperomia*, narrating the history of the discovery of each, and showing specimens of the five known to date. Several of these are Dr. Small's own findings in Florida, and a few he has described as new to science. The genus is a wide-spread tropical one, belonging to the pepper family, and in Florida is confined to the peninsula, mainly its southern subtropical portion.

A. B. STOUT,
*Secretary of the Conference*

## NOTES, NEWS AND COMMENT

Mr. F. S. Collins of North Easton, Mass., author of "The Green Algae of North America" and other well-known works on the algae, was a visitor at the Garden on March 24 and 25.

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Mr. H. Guthrie Smith, of Tutira, New Zealand, was a visitor at the Garden April 2, en route to Scotland. Mr. Smith has been a student of the New Zealand flora for nearly forty years, devoting chief attention to the introduction of foreign plants. Contrary to the statement of Hooker, he finds that foreign species are seldom if ever able to compete successfully with the native vegetation, and are always limited to areas influenced by man.

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Dr. A. B. Stout, of the Garden staff, recently gave an address before the Biological Club of Princeton University on the subject of "Fertility and Sterility in Plants."

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A dendrograph has been installed on a maple in the Botanical Garden. This apparatus was devised by Dr. D. T. MacDougal, formerly of the Garden staff and now Director of the Department of Botanical Research, Carnegie Institution of Washington. The dendrograph is used in obtaining a continous record of growth and other changes in the volume of tree trunks. The instrument records such changes automatically with remarkable precision and after it is properly installed no attention is necessary except a weekly visit to remove and replace the record blanks and to wind the eight-day clock of the recording drum. The particular instrument installed in the Garden was supplied by Dr. MacDougal and records obtained will be used by him together with others obtained on various specimens of trees growing in widely separated parts of the United States.

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*Meteorology for March.*—The total precipitation for the month was 3.16 inches of which 0.40 inches (4 inches snow measurement) fell as snow. The maximum temperatures recorded for each week were 47° on the 5th, 57° on the 10th, 55° on the 16th, 73° on the 25th and *74° on the 31st.* The minimum temperatures were *11° on the 7th and the 8th*, 19° on the 14th, 24° on the 19th, and 31° on the 25th.

# ACCESSIONS

## PLANTS AND SEEDS

3 plants of *Zygocactus*. (Given by Mrs. E. Cornell.)

1 plant of *Serissa foetida*. (Given by Mr. E. D. Adams.)

6 plants of *Taxus canadensis*. (Given by Dr. L. R. Morris)

1 plant of *Robinia*. (Given by Mr. W. W. Ashe.)

7 plants of *Thrinax* from Porto Rico. (Given by Mr. D. W. May.)

5 plants for conservatories. (Given by Mr. Donker, through Dr. J. K. Small.).

1 plant of *Dracaena*. (Given by Mrs. Simon Sterne.)

1 plant of *Corallorrhiza maculata*. (Given by Mr. M. L. Bryant.)

1 plant of *Dryopteris setigera*. (Given by Mr. Severin Rapp.)

158 hardy woody plants. (By exchange with Hicks & Son.)

1 plant of *Citrus decumana*. (Given by Mr. S. Corker.)

1 plant for nursery. (Given by Mr. D. S. George.)

1 plant of *Peperomia cumulicola*. (Given by Mr. John Soar.)

3 plants of *Ampelopsis aconitifolia*. (Given by Mr. H. Wolfgang.)

2 plants of *Cyanotis kewensis*. (Given by Mr. H. W. Becker.)

1 plant of *Sansevieria*. (Given by Mr. S. A. Wade.)

3 plants of *Cimicifuga gigantea*. (Given by Mr. James Stuart.)

1 plant for conservatories. (Given by Mr. R. A. Gilliam.)

2 plants of *Arisaema triphyllum*. (Given by Miss M. E. Kittredge.)

5 plants of *Acacia*. (Given by Mr. Louis Dupuy.)

23 plants of *Acacia* for Range 2. (Purchased.)

8 plants of *Nephrolepis*. (Purchased.)

200 plants of Douglas spruce for Victory Grove. (Purchased.)

50 plants of white fir for horiticultural garden. (Purchased.)

41 Florida plants. (Collected by Dr. J. K. Small.)

7 plants of *Lonicera plicata*. (Given by Mr. John Finley.)

1 plant from Santo Domingo. (Given by Mr. W. L. Abbott.)

4 plants of *Opuntia* from South Carolina. (Collected by Dr. J. K. Small.)

8 plants of *Opuntia* from North Carolina. (Collected by Dr. J. K. Small.)

2 plants of *Opuntia* from Florida. (Collected by Mr. J. A. Harris.)

11 plants of *Gaylussacia brachycera* from Perry Co., Penn. (Collected by Dr. J. K. Small.)

35 cactus plants from Florida. (Collected by Dr. J. K. Small.)

2 plants of sundew from New Jersey. (Collected by Dr. F. W. Pennell.)

8 plants of *Opuntia*. (By exchange with Mr. J. A. Harris.)

1 plant of *Agave Victoriae-Reginae*. (By exchange with Mr. W. H. Bickelhaupt.)

3 plants of yarrow. (By exchange with U. S. Dept. of Agric.)

2 cactus plants. (By exchange with U. S. Dept. Agric., through Dr. J. N. Rose.)

2 plants of *Epiphyllum*. (By exchange with U. S. Dept. Agric.)

148 plants for conservatories and nurseries. (By exchange with Bureau of Plant Industry.)

1 plant of *Cattleya Trianae*. (By exchange with Mr. Adam Muller.)

7 plants from the Bahamas. (Collected by Mr. L. I. Brace.)

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# The New York Botanical Garden

EDITOR

H. A. GLEASON

*Assistant Director*

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River-cypress strand on the eastern shore of Lake Okeechobee, comprises one of the most impressive sights in the State Large portions, however, have been destroyed by fire The humus in some places has been burning for several consecutive years. After a fire the giant trees fall down and are either sawed into lumber or left to decay. The trees often harbor great quantities of Florida moss (*Dendropogon*), but few other air-plants.

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# CYPRESS AND POPULATION IN FLORIDA

## THE RELATION OF PHYTOGEOGRAPHY TO THE DRIFT OF POPULATION AS SHOWN IN THE CASE OF TAXODIUM

WITH PLATES 245–247

Some botanical genius with a taste for research will come along some day and show how closely related, at least according to our text-books, has ever been plant geography and political geography. This is not in reference to the redistribution or readjustment of floras which usually follow man's advent in new fields. It is in reference to what existed there before man's advent, or before the botanist's advent, at any rate.

Consider the case of our valuable cypress forests, for example—of *Taxodium*, otherwise known as cypress, bald-cypress, river-cypress, pond-cypress, whence the "wood-eternal" as the lumber advertisements have it.

The geographic range of this deciduous-leaved conifer—whence one of its common names, bald-cypress—is confined almost wholly to the Atlantic and the Gulf Coastal Plains, extending from southern New Jersey to Florida, southern Indiana, southern Missouri, and Texas.

The habitats often assigned for it are "River-swamps usually submerged during several months of the year, low wet banks of streams, and the wet depressions of Pine-barrens."[1]

In passing, it may be mentioned that while the more acute taxonomists of a century ago had already discerned two kinds or species of *Taxodium*, generations of their less acute successors

[1] C. S. Sargent, Manual of Trees of North America 72. 1905.

still recognized but one. Not until the beginning of this century were the two species again clearly segregated.[1] In this connection consider also the above quoted statement of habitats. It is in the river-swamps and along the stream-banks that we find the *Taxodium distichum*—river-cypress, that which was described in 1753, while that of the pine barrens is *Taxodium ascendens*—pond-cypress, which was confused with the former cited species up to 1818, when it was separated under varietal rank, but was not recognized as a distinct species until 1833.

But the point is this: that less than a score of years ago the recorded southern limit for the geographic distribution of either cypress *still coincided almost exactly with the geographic limit of Florida's modern development.*

In leading works on trees[2] about the beginning of this present century under the paragraphs devoted to the geographic distribution of this conifer we may read ". . . southward near the coast *to the shores of Mosquito Inlet and Cape Romano. . . .*" The italics are ours. These two localities represented, as a matter of fact, not the southern limit of *Taxodium*, but of modern civilization, on the east and the west coast respectively down almost or quite to the present generation. A straight line connecting these regions of settlement diagonally divides peninsular Florida in two almost equal parts,—that lying to the northwest of the line, long ago pretty well settled, that lying to the southeast, until recently practically unsettled, or relatively speaking, the former a *terra cognita*, the latter a *terra incognita*. In this instance, at least, botany had waited on the railroads. The comparatively recent extension of the railway along the eastern coast of Florida from New Smyrna to Miami, and later to Key West, made possible—even easy—access to a storehouse of botanical lore hitherto closed.

Curiously enough, the arbitrary line of division above referred to also divides, in a general way, the higher portion of the state from the lower portion.

[1] R. M. Harper, Bulletin of the Torrey Botanical Club 29: 383–399. 1902; 32: 105–115. 1905.

[2] C. S. Sargent, Silva 10: 153. 1896; Manual of the Trees of North America 72. 1905.

Pond-cypress head in the Big Cypress Swamp. This species grows more in heads than in strands. Heads may comprise a few trees or may extend over many acres of area. The growth of cypress in the southern part of the peninsula, particularly the pond-cypress, has not yet been greatly devastated, but proposed highways into the frontier parts of that region will invite large lumbering operations. The trees of the pond-cypress are the favorite harbors for several species of air-plants (*Tillandsia*)

Strange that the Big Cypress Swamp—which has been so designated on maps of Florida, at least since 1849—should have been excluded from this recorded geographic range of the cypress! Whence the name, if cypress did not grow there? Likewise, on the lower eastern coast the cypress was not hidden from view, in fact it is so prominent a feature on the old trail and main highway that it seems hardly possible that it could have been kept out of the records of distribution.

There are several ways to account for this rather striking political development of Florida—however much we lack the phytogeographic explanation; but none is wholly satisfactory. Perhaps the most logical theory is that as the Seminoles migrated southward, they followed the line of least resistance, which, in this case, was the higher part of the peninsula. As they proceeded southward they probably exterminated or absorbed the remnants of the aborigines that had escaped the Spanish. Then about the beginning of the last century, when the white man from the United States got glimpses of Florida beyond the frontier borderlands, he set out in turn to exterminate the Seminole along these Seminole trails, and this process continued for nearly half a century. During this period, Florida meanwhile becoming part of the United States, the territory from which the red man was driven became dotted with forts, many of which became permanent settlements and soon developed into towns.

The business of Indian hunting was not confined to the northwestern division of the peninsula, of course. Many forts were located far down in the southeast and southwest. But here the lines of communication were so tenuous, and the swamps and marshes so vast, and the Indians so able to hold their own, that civilization faltered, and failed to take hold. It is a melancholy but noteworthy fact that although our government spent treasure and blood prodigally in this land of botanical luxuriance, our botanical knowledge of it remained virtually at a standstill. For much of Florida, so it has remained ever since. In the lower part of the peninsula—in the Everglades, in the Big Cypress, among the Ten Thousand Islands, and even north of Okeechobee —there are still miles of lonely wilderness.

But it was these observations on the cypress along the frontier settlements in the last century that probably crystalized the recorded southern limit of the distribution of this remarkably important forest and timber tree. Thus, I suppose we must account for the coincidence of the southern cypress-limit and the limit of political distribution.

Now, notwithstanding this definite statement which stood so long regarding the geographic distribution of the cypress in the state, there is, perhaps, more cypress in Florida outside of the recorded area than within it. As a matter of fact, its range extends southward almost or quite to the Cape Sable region, that is to say, the extreme southern tip of the peninsula. It is the abundance that renders the former detailed records of distribution at once so absurd and so difficult to interpret.

We can understand to some extent, at least, the oversight or ignoring of its occurrence in the interior, even if the Big Cypress Swamp did appear on early maps. But botanists and dendrologists were not ignorant of the vegetation of the eastern coast of Florida, In fact, the main features had been quite well known for the past several generations.

There, particularly on the lower eastern coast, both species of the cypress approach nearly or quite to the sea, at least—and at many points—to the coastal lagoons. The river-cypress follows nearly all the streams flowing from the Everglades to the Atlantic Ocean almost as far south as Cutler, the southernmost settlement on the eastern coast. It is common in the Snapper Creek hammocks a few miles north of Cutler and was always a conspicuous element in the arboreous vegetation along the west and south branches of the Miami River, a stream quite well known to botanists for over half a century.

The pond-cypress does not extend as far south on the eastern coast as its larger relative, but it is often conspicuous in the landscape.

Thus the stereotyped record of distribution of *Taxodium* in Florida neglects at least four great regions. They are, the Lake Okeechobee basin, the Big Cypress Swamp, the lower eastern coastal district, and the southern end of the Everglades.

Two kinds of cypress, river-cypress (*Taxodium distichum*) on left, pond-cypress (*T. ascendens*) on right. Besides the differences in habit as shown in the two preceding plates, the trees differ in the leaves, not alone in the position, but in the shape. The fruits of the two species have not yet been carefully compared.

In all these regions occur both kinds of cypress—*Taxodium distichum* and *Taxodium ascendens*. The river-bottoms, the lake shores, and the "sloughs" support the first-named species, which is known as river-cypress. The other species, known as pond-cypress, is usually confined to the prairies and low pine-lands, although it does occur rarely on sand-dunes—for example, on those near Juno on the Atlantic coast. The greatest development of the pond-cypress is doubtless in the Big Cypress Swamp, while the common cypress is apparently most copiously developed in the Lake Okeechobee region and upper Saint John's basin.

The vastness of growth of the large cypress in the Okeechobee basin can be appreciated only by seeing it. The shores of the lake, particularly the eastern and northern shore, the tributary streams, notably the Kissimmee River, the Onothohatchee, Cypress Creek, Mosquito Creek, and Fisheating Creek, and outlying sloughs often support almost impenetrable stands of beautiful trees. The trunks, tall and clear of branches, furnish the favorite material for the dug-out canoes of the Cow Creek Seminoles. The cypress forest on the eastern shore of Lake Okeechobee is one of the most impressive sights in all Florida.

The prairies that surround the fringe of the Everglades, which in turn encompass Okeechobee, are also high, but occasional lower areas support considerable pond-cypress.

The region of the Big Cypress Swamp is typically low prairie, hence a vast development of the pond-cypress. In other words, much of the cypress of the Big Cypress is not big. However, the large cypress is not wanting. In the Okaloacoochee Slough, smaller sloughs, and on lake shores we find beautiful forests of large trees. The Okaloacoochee Slough is the favorite locality for the Big Cypress Seminoles to obtain canoe material.

The eastern coastal region is well supplied with cypress. It occurs along nearly all the creeks and rivers, in the intersecting prairies of the Everglade Keys, and on the edges of the Everglades—there principally as isolated cypress heads. These clumps of cypress trees, both large and small, are much affected as temporary camping places by Seminoles as they travel to and from their permanent camps. The trees in the river bottoms are also large enough to furnish the materials for their canoes.

In several ways the southern end of the Everglades or the prairie between the Everglade Keys and the Bay of Florida is particularly interesting. There we find the most stunted growth of the pond-cypress and the most massive growth of the other species. On the one hand, we find vast areas with a growth of small pond-cypress trees about as high as one's head or twice as high, but with all the appearances of great age. On the other hand, there we find the most massive development of the river-cypress.

South of the latitude of Royal Palm Hammock one may see large dome-like masses of vegetation which, from the distance of a mile or two, he would consider to be good-sized Everglade hammocks. Imagine the surprise of the writer when he investigated one of these seeming hammocks several years ago, and found it to be a single cypress tree!

These large cypress trees are not, however, like those further north—so stately and straight, branching often only at the top. The trunks are usually short, as well as stout. In the case of the individual just referred to above, the trunk—about twelve feet in diameter—was branched ten feet from the ground. The branches grew nearly at right angles to the main stem, and were in themselves as large as good-sized trees.

Another very interesting feature of this region of the little cypress trees and the big cypress trees is the association of this typically fresh-water plant with the mangrove, a typically salt-water plant.

The cypress extends well down towards the influence of salt water, if not actually to it, while the mangrove extends up into the prairies far beyond any apparent saline influence. When we penetrate further south it will be interesting to learn if the cypress actually reaches the influence of the tide of the Bay of Florida. This, however, is apt to remain a mystery for many years. Florida is a land of underground rivers, and perhaps of underground tidal currents as well.

JOHN K. SMALL

# VOCATIONAL EDUCATION IN GARDENING FOR DISABLED AND CONVALESCENT SOLDIERS AND SAILORS

The vocational training of gardeners in the New York Botanical Garden actually began on January 16, 1919, one disabled soldier beginning training at that time under an agreement between the Garden and the Federal Board for Vocational Education. Until March 3, 1919, strictly practical training was given under our gardeners. On that date the number of men in training had reached seven and they were formed into the first class of instruction. Since that time the number of students sent by the Federal Board has increased to fifty during January, and five civilians have been in the classes at one time or another.

The training of young gardeners is an important problem before the horticultural world today. The National Association of Gardeners is considering it at present, studying ways and means of interesting young men in gardening as a profession. Undoubtedly the Old World method of apprenticeship has trained the best gardeners. The present day problem is to get into our training as much of this method as possible, as well as a certain amount of scientific study and horticultural interest. Garden labor is scarce at the present time, and in competition with other industries is losing ground, owing to the extreme wages paid by other lines. Then, too, as recently pointed out by one of the experts of the profession, the beginner in gardening, the garden laborer or apprentice, does not show the interest, does not care to study, is not inspired to broaden out in the science of gardening as it is talked, written, and lectured about today. Most of the gardening education of today tends toward these latter points and the training here has covered these and in some measure the need also for practical apprentice-training. Starting with younger students, who are in good health, with a system of strictly practical training, under competent gardeners, together with the study of soils, botany, plant materials, pathology, entomology, and other related subjects and the broadening influences of horticultural literature, flower exhibitions, etc., the

ideal training would result. The percentage of persons naturally adapted to gardening is not large. We have found young men whose fathers before them were successful gardeners and florists, and though they themselves were strictly at home with plants, still they did not care to continue in the profession. However, it is probable that a sufficient number of young men can be found who will take to the work and become successes in it. For the disabled veteran of the war, gardening or one of its branches should give an interesting, healthful occupation, and the same percentage of his class would qualify as of any other at the present day. It is a matter of selection and individual preference.

Our practical training has been carried on in accordance with the seasonal work around the Garden and conservatories. Practice in care of houses and the plants in them has been accomplished both by individual work of students with our gardeners and in small classes. This work has included potting and tubbing of large conservatory plants, such as would be encountered in the conservatories of large country estates, the washing of plants for scale insects, care and potting of orchids and ferns, pruning and arrangement of plants in houses, the spraying of these plants with hand sprays, and general practice in watering, ventilation, and the maintenance of conditions in greenhouses for the growth of different types of plants.

The propagation of many of the commoner greenhouse plants, such as *Acalypha*, *Aucuba*, *Begonia*, *Bougainvillea*, *Cestrum*, *Clivia*, crotons, *Dracaena*, *Fittonia*, *Eranthemum*, *Ficus*, *Lantana*, bay trees, *Aralia*, and *Sansevieria* has been attempted on a small scale. The propagation of the common bedding plants and geraniums has been carried on during the winter. Varieties of *Coleus*, *Alternanthera*, *Iresine*, *Ageratum*, *Echeveria*, *Vinca*, *Cuphea*, and *Santolina* have been propagated by cuttings on a large scale. This practice has been done in the propagating houses, with comparatively large classes, and with almost uniform success. The constant practice of making and rooting cuttings, potting up when rooted and shifting when necessary, together with the general care of the small houses, has been of very practical value. Seeds have been sown of the more common greenhouse flowering

plants, such as *Cyclamen*, primrose, and *Gloxinia*, for flowering next summer, fall and winter; seeds of the early vegetables and of our annual garden flowers have also been sown. The sowing of vegetable and annual seeds is especially in point for the students who worked among them last year. Practice in forcing some of the bulbous plants, such as *Narcissus*, miniature hyacinths, and tulips, was also carried on, some of these flowers being placed on exhibition at Range No. 2.

The outdoor gardening practice has been varied. The first of this attempted by the school was spraying for scale insects during March, 1919. Hugh O'Neill, a student who had previously worked for the Newark, N. J., Shade Tree Commission, handled the extension apparatus as easily with the right hand and crook of the left elbow, as he had before he lost his hand in France. Beginning April 14, a course in vegetable gardening was given. The smaller crops were grown in small gardens on the site of the School Garden plots east of the Lorillard Mansion. Radishes, onions, beets, chard, parsley, carrots, salsify, lettuce, and spinach were grown here. Each student had a plot to himself, and harvested many messes of fresh picked vegetables. An area south of the Nursery was devoted to the larger crops, such as beans, potatoes, corn, cabbage, celery, kale, egg-plant and tomatoes. One disabled student, with an artificial leg, could do the work encountered in the care of such gardens, but he was not able to walk great distances for the other work.

Flower gardening commenced in the spring of 1919 with the spading of the flower beds. Annual flowering plants were planted out in the spaces left by the bulbs, peonies were disbudded and made an unusually fine display, many spaces devoted to perennials were renovated, general care was given to the collections, and chrysanthemums were planted for fall blooming.

The growing of the prominent outdoor flowering plants proved more interesting to most of the students than many other phases of gardening work. The large collection of *Gladiolus* in the Horticultural Collections was planted by the class, cared for, and dug in the fall. Variety studies were made, and lists prepared by the more advanced students for use in their own gardens

| Name | Entered | Duration | Left | Disability |
|---|---|---|---|---|
| Abbott, Thomas T., Paterson, N. J. | September 8, 1919 | 1 yr. | | Valvular heart disease |
| Baiano, Carmelo, Dobbs Ferry, N. Y. | April 4, 1919 | 1 yr. | | Gun shot wound, foot |
| Bland, Frank A., New York | April 5, 1920 | 1 yr. | | Shell shock |
| Bernstein, William, New York | February 9, 1920 | 1 yr. | April 1, 1920 | Tuberculosis arrested |
| Blumborg, Isidor, New York | February 17, 1919 | 1 yr. | September 15, 1919 | Neurasthenia |
| Boyd, George S., Peekskill, N. Y. | February 24, 1919 | 1 yr. | October 1, 1919 | Tuberculosis arrested. Heart and stomach |
| Brunt, Warren J., Philadelphia, Pa. | December 9, 1919 | 1 yr. | April 1, 1920 | Gunshot wound. Tuberculosis arrested |
| Caples, Jeremiah, Wellingford, Conn. | July 7, 1919 | 1 yr. | | Loss one thumb joint. Ankylosis |
| Cerrone, jr., Anthony, Mount Vernon, N. Y. | July 7, 1919 | 1 yr. | | Chronic otitis media |
| Christof, George J., New York | January 5, 1920 | 3 mo. | | Tuberculosis arrested |
| Colburn, Miss Daisy, New York | March 15, 1920 | 1 yr. | | |
| Curatol, Lawrence, Tuckahoe, N. Y. | August 16, 1919 | 2 mo. | March 8, 1920 | Tuberculosis. Gassed |
| Devaney, Patrick J., Dayton, Ohio | January 5, 1920 | 1 yr. | March 15, 1920 | Tuberculosis arrested |
| Downing, Edward, New York | May 1, 1919 | 1 yr. | | Tuberculosis arrested |
| Edmonds, Lloyd G., Front Royal, Va. | February 13, 1920 | 1 yr. | | Shell shock |
| Ewing, Henry O., New York | April 29, 1919 | 1 yr. | | Stomach trouble |
| Fabrizio, Michael, New York | May 12, 1919 | | May 20, 1919 | Eye trouble |
| Fagan, Hugh, New York | January 19, 1920 | 1 yr. | | Gunshot wound. Partial paralysis |
| Feltham, Thomas, Newport, R. I. | February 17, 1919 | 6 mo. | October 1, 1919 | Injured knee |
| Flanagan, Peter, New York | November 21, 1919 | 1 yr. | January 16, 1920 | Tuberculosis |
| Galino, Felix, New York | November 10, 1919 | 1 yr. | April 1, 1920 | Gunshot wound. Loss right eye |
| Ganyard, Raymond A., Cleveland, Ohio | April 17, 1919 | 1 yr. | June 18, 1919 | Amputated left leg |
| Graham, Charles, Yonkers, N. Y. | March 3, 1920 | 3 mo. | April 1, 1920 | Gassed |
| Hamm, Howard H., New York | December 9, 1919 | 1 yr. | | Psychoneurosis. Gunshot wound leg and finger |
| Healy, Raymond C., New York | October 28, 1919 | 1 yr. | February 15, 1920 | Gassed |
| Hohmann, Edward, Brooklyn, N. Y. | November 2, 1920 | 1 yr. | | Gunshot wound mouth. Gassed. Dyspnoea |
| Holt, Platt E., New York | March 1, 1920 | | March 15, 1920 | Tuberculosis arrested |
| Greebler, Benny, New York | October 23, 1919 | 1 yr. | April 10, 1920 | Tuberculosis arrested |

STUDENTS—*Continued*

| Name | Entered | Duration | Left | Disability |
|---|---|---|---|---|
| Jacobs, Louis N., Petersburg, Fla. | October 21, 1919 | 1 yr. | April 1, 1920 | Tuberculosis arrested |
| Jones, Joseph B., New York | November 17, 1919 | 6 mo. | April 1, 1920 | Mastoiditis. Otitis media |
| Killeen, John J., New York | January 19, 1920 | | April 1, 1920 | Diabetes |
| Koch, Emil, New York | December 1, 1919 | 1 yr. | March 15, 1920 | Gunshot wound leg |
| Lair, Henry T., Lawrenceville, N. J. | June 24, 1919 | | June 24, 1919 | Tuberculosis arrested |
| Landrum, Warren R., Hattisburg, Miss. | March 3, 1919 | 1 yr. | October 10, 1919 | Tuberculosis arrested |
| Lane, John, New York | February 10, 1920 | | March 1, 1920 | Tuberculosis arrested |
| Laterwech, Stephen, Ansonia, Conn. | May 21, 1919 | 1 yr. | | Tuberculosis arrested |
| Laura, Joseph B., New York | October 21, 1919 | 1 yr. | | Eye and ear troubles |
| Loftus, Thomas, Norwich, N. Y. | April 17, 1919 | 1 yr. | June 6, 1919 | Tuberculosis arrested |
| Marcus, Nathan, New York | January 26, 1920 | 1 yr. | | Shrapnel wound. Gassed |
| McAllister, Henry, New York | February 9, 1920 | 1 yr. | April 1, 1920 | Heart trouble |
| Meyerowitz, Nathan, New York | June 9, 1919 | 1 yr. | | Acute rheumatism |
| Murray, Walter J., New York | June 24, 1919 | 1 yr. | January 15, 1920 | Tuberculosis |
| Nappi, Louis, New York | March 3, 1919 | 1 yr. | | Nervous trouble |
| Nembach, Albert B., Port Washington, N. Y. | February 18, 1920 | | April 1, 1920 | Tuberculosis arrested |
| Newman, Egnatius, New York | January 5, 1920 | 1 yr. | | Tuberculosis arrested |
| O'Brien, William J., Brooklyn, N. Y. | January 5, 1920 | 6 mo. | March 1, 1920 | Tuberculossis arrested |
| O'Neill, Hugh F., New Haven, Conn. | March 11, 1919 | 1 yr. | | Amputated left hand |
| Palmeri, Umberto, New York | November 10 1919, | 6 mo. | | Tuberculosis arrested |
| Paris, Frank, Yonkers, N. Y. | October 28, 1919 | 1 yr. | January 5, 1920 | Gunshot wound |
| Pauline, Laurence, Port Chester, N. Y. | October 20, 1919 | 1 yr. | | Chronic bronchitis. Tachycariad. Myocarditis |
| Poupard, Percy H., New York | January 12, 1920 | 1 yr. | | Valvular heart trouble |
| Reilly, James B., New York | December 1, 1919 | 1 yr. | | Loss of hearing. Ruptured ear drums |
| Rollins, Pinckney C., Washington, D. C. | January 20, 1920 | 1 yr. | | Gunshot wound. Gassed. Chronic nephritis |
| Sacchetti, Antonio, Yonkers, N. Y. | August 1, 1919 | 1 yr. | | Gunshot wound left arm and side |
| Schultz, John V., New York | January 29, 1920 | 1 yr. | | Gunshot wound. Shrapnel wound |

| Name | Entered | Duration | Left | Disability |
|---|---|---|---|---|
| Sheehan, Thomas, Brooklyn, N. Y. | November 21, 1919 | 1 yr. | | Partial paralysis of external and internal nerve of leg |
| Sindler, Thomas E., Islip, N. Y. | February 3, 1919 | 1 yr. | May 16, 1919 | Loss of hearing |
| Snyder, Walter F., Wurtsboro, N. Y. | October 20, 1919 | 1 yr. | March 1, 1920 | Tuberculosis |
| Sobol, Philip, New York | June 11, 1919 | 1 yr. | | Tuberculosis arrested |
| Steele, William M., Yonkers, N. Y. | July 22, 1919 | 3 mo. | March 1, 1920 | Stiff finger. Mental deficiency |
| Swentzel, Henry C., New York | June 19, 1919 | 1 yr. | July 7, 1919 | Compound fracture hip |
| Tanikawa, John M., Hilo, Hawaii | October 30, 1919 | 1 yr. | | Gassed |
| Tare, Nathaniel, New York | March 15, 1920 | | | Gunshot and shrapnel wounds. Gassed |
| Toole, John F., Clinton, Mass. | June 2, 1919 | 1 yr. | | Conjunctivitis. Gunshot wound ear |
| Ulrich, Max, New York | December 1, 1919 | 1 yr. | | Tuberculosis arrested |
| Vacchio, Sebastiano, New York | June 2, 1919 | 1 yr. | March 15, 1920 | Shrapnel wound left knee, limited flexion |
| Wager, William, New York | December 1, 1919 | 6 mo. | March 1, 1920 | Wound in head. Fractured skull |
| Wagner, Arthur, New York | October 6, 1919 | 1 yr. | | Operation for sinusitis and ethmoiditis |
| Weisinger, William, New York | November 21, 1919 | 1 yr. | | Gassed |
| Willis, James M., New York | February 4, 1920 | 1 yr. | | Gunshot wound chest and shoulder |
| Woerter, Charles, New York | January 13, 1920 | 1 yr. | | |
| Wozniak, Michael, Detroit, Mich. | January 16, 1919 | 1 yr. | Died June 3, 1919 | Tuberculosis. Shell shock |

later on. Some practice in planting the large collection of dahlias was given, and the types and varieties, which were so well arranged and bloomed so magnificently as to form an exceptional opportunity for study, were watched throughout the entire season. Cannas were included in the summer work with flowers. This spring some students have potted the large collection at Range No. 2, and it is to be hoped that the collection will make such a showing as it did in 1919. During the past winter the class has tried the propagation of the smaller evergreens, such as retinosporas, yews, junipers, etc., by cuttings placed in sand, and the propagation of many of our flowering shrubs by long cuttings, such as are used in propagating privet, willow and other shrubs. These cuttings are being stored until late spring, when they will be rooted in the open ground. Among the shrubs treated in this manner were *Forsythia*, *Corylus*, *Tamarix*, *Ribes*, *Viburnum*, *Sambucus*, weigela, *Benzoin*, *Kerria*, *Staphylea*, *Dirca*, and *Exochorda*.

During 1919, the students attended many practical demonstrations of path-building, grading, tree-moving and other branches of the park work.

The elementary study of plants and plant functions has been a continuous feature of the gardening course. Elementary botany, including a study of seeds, seedlings, buds, stems, leaves, flowers, and fruits, was given in the spring quarter of 1919, followed in the summer quarter by a course in elementary plant physiology. Botany was taken up again during the winter, and will be followed by more plant physiology for the new students. Garden zoology, a course devoted to the study of insects and animals encountered in horticultural work, was taken up during the spring and summer of 1919.

One afternoon a week throughout the year is devoted to garden botany, a study of the plant materials used in gardening and its branches, their identification, habit of growth, uses, and interesting features. During the winter months greenhouse plants, conifers, and broad-leaved evergreens are studied. In summer the flowering shrubs, trees, annual flowering plants, perennial border plants, bulbs, and bedding plants are considered at all stages of

their growth. Although a real knowledge of such a diversity of plant materials can only be gained through constant association with the plants, a general knowledge of relationships and conditions is acquired, sufficient to give ideas for location, planting, and care during growth, protection in buying, and interest to go beyond the rather limited scope covered in most gardening work. Broad-leaved and other evergreens for winter color and attractiveness; berry-bearing shrubs for winter color and food for our friends, the birds; plants, especially many natives, which are so well adapted to wild swampy spots and the banks of streams, are all considered. Although the old garden plants such as geraniums, salvias, petunias, and *Coleus* are the most easily learned, some of the more beautiful and more valuable kinds make the most lasting impression on the student. The Chinese *Abelia* will be remembered and planted when *Hydrangea paniculata grandiflora* is forgotten.

The Cyclopaedia of American Horticulture and the Illustrated Flora of the Northeastern States have been used for reference in this study of plants. These works are accessible to the students in their reading room at the Mansion. Text books on gardening and floriculture are furnished, through the Garden, by the Federal Board for Vocational Education.

KENNETH R. BOYNTON.

## TREES GIRDLED BY MEADOW MICE

One day early in March, I saw about noon at the Elevated Approach a brown rat, a gray squirrel, and a cottontail rabbit. The first two were actively hunting for something to eat, while the rabbit sat on the snow with its eyes to the sun fast asleep.

The brown rat is always with us, and is not only very destructive but helps to spread many diseases. The gray squirrel continues to be the delight of park visitors in spite of its shiftless habits, its fondness for buds and maple sap, and the fact that it destroys birds' eggs and young birds before they are able to fly. Two specimens of the black variety are frequently seen in the

hemlock grove. The cottontail rabbit is fairly abundant in our grounds, making its nests near the buildings and being quite socially inclined. Although destructive in many sections, the injury done by them here is so slight as to be negligible. They seem to stand on top of the snow and reach for the young twigs, which they nip off with a clean cut. I do not know of a single case of girdling which can be attributed to them.

But the common meadow mouse is very destructive every winter, and has been unusually so during the one just past, doubtless owing to the abundance of snow and ice.

Walk through any grassy meadow and you will notice little runways forming a network over the surface of the soil and winding in and out among the vegetation. These are made by mice about as long as the common house mouse but with thicker body and shorter legs and tail. They keep the runways very smooth and free from straws so as to reach their burrows quickly in case of alarm.

In their comfortable nests of dry grass, several litters of from four to eleven young are reared each year. Hawks, owls, crows, foxes, weasels, cats, and other natural enemies prey upon them continually—and still they increase. They consume large quantities of growing and matured crops and often destroy entire orchards by gnawing the bark from the base of the trunks and roots of trees. In winter, they tunnel under the snow from one tree or shrub to another.

No store of food is laid up for cold weather by the southern species, but there is one in Alaska that gathers and hides in its nests a quart or more of little bulbous grass roots, which the Eskimo women search for eagerly and boil to serve to their guests during winter festivals.

To recount all the damage done by meadow mice in their search for food on our grounds during the past winter would make quite a story. A great many different kinds of trees and shrubs were attacked; and the attack was made in different ways according to the quality of the bark, the depth of the snow, the amount of dry grass present, etc.

The object of the mice being to get at the food stored in the

inner bark, it was necessary for them first to gnaw away the outer corky layers, after which the tender inner layers were consumed down to the wood. On account of this complete girdling no food can pass to the roots, which will be speedily starved out and the trees will die. In the case of shrubs, new shoots will spring up, but this will take some time.

Several of the splendid Japanese flowering cherries were completely girdled for a distance of six inches or a foot near the base. Four of these are young trees, six inches in diameter, and good bloomers; while one belongs to the first lot set out many years ago. Two other fine trees in the cherry orchard are nearly girdled and will either die or become practically worthless.

In the maple collection nearby, at least two trees have been destroyed; and four Japanese maples in the Fruticetum have been girdled. In the case of one of the latter, many of the lower limbs were covered with snow and these were entirely stripped of their bark. In the hawthorn collection, also, several trees have suffered in this way, but none appear to have been girdled.

Two lindens, one poplar, several wild cherries, and other trees scattered about the grounds have likewise suffered; but not to the same extent as the shrubs.

In the lilac collection recently installed on Pelham Parkway, containing many fine French varieties, between thirty and forty plants have been destroyed. In the weigela group north of the lake near the museum building, twelve of the large clusters have been completely girdled; while at the Mosholu Approach and elsewhere, the weigelas have suffered severely.

The Georgia syringa collection is planted in a low spot in the Fruticetum, where there is much grass and the snow lingered long. Here the mice camped among the stems a foot or more above the ground and played havoc with nearly every one of them, eight large clumps being destroyed. The oriental sweet shrub on the bank above seemed to be especially attractive to the mice, eight of these clusters having been destroyed.

A group of deciduous holly was wiped out; shrubs of the pea family; privets; willows; almost anything within reach seemed acceptable to this small, lurking enemy, which is so difficult to

combat. We shall have to accept our losses with equanimity; keep the grass down as much as possible; and hope for less snow another winter.

Bridge grafting is often recommended to save trees that have been partially girdled by mice. It is done in April, when active growth is beginning aad before the wounds have dried out. My own feeling, however, is that the base of a tree is such a vulnerable point that it would probably be wiser to remove most trees thus injured and put in new ones.

W. A. MURRILL

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## CONFERENCE NOTES FOR APRIL

The April conference of the Scientific Staff and Registered Students of the Garden was held in the laboratory of the Museum Building, Wednesday, April 7, 1920, at 3:30 P.M. Dr. Marshall A. Howe spoke on "The Marine Algae of the Bahamas," illustrating the talk by numerous specimens, dried and in fluid.

The talk was chiefly a résumé and analysis of the speaker's account of the Bahamian algae contributed to the Britton and Millspaugh "Bahama Flora," then in press. This account was based mainly upon specimens collected by the speaker during three visits to the Bahamian archipelago made in 1904, 1905, and 1907, supplemented by earlier and smaller collections made by Dr. E. Palmer, Mr. and Mrs. John I. Northrup, Mrs. G. A. Hall, and Prof. W. C. Coker, and later ones made by Mr. Percy Wilson and Mr. L. J. K. Brace.

The Bahamian archipelago, according to the report of a former governor of the colony, consists of "29 islands, 661 cays, and 2,387 rocks," and, in addition to the coast lines offered by these islands, cays, and rocks, there are extensive areas of shallow water known as the Bahama Banks, areas of hundreds of square miles where the water is commonly from one foot to twenty feet deep. Most of the islands have shores that are in large part rocky, the rock being of oolitic or aeolian limestone and offering a good foothold for marine algae. The oolitic sand resulting from the decomposition of this rock is in some places too shifting

and unstable to allow any great development of algae, but it is usually rather compact and offers anchorage for many kinds of marine plants. Some of the Siphonaceous green algae, especially the Codiaceous genera *Penicillus*, *Rhipocephalus*, *Udotea*, *Halimeda*, and *Avrainvillea*, and certain species of *Caulerpa*, have a highly developed system of deeply penetrating rhizoids, which form compacted subterranean anchors, sometimes roughly suggesting the roots of carrots or parsnips, and by the aid of these they are able to maintain themselves on a sort of bottom that in more northern climes would be wholly destitute of the more conspicuous algae. Comparisons with the marine floras of Cuba, Jamaica, and Porto Rico and other parts of the West Indian region visited by the speaker, indicate that the Siphonales have their greatest development, both as to number of species and abundance of individuals, in the Bahama Islands and the adjacent Florida Keys.

If the diatoms are included, the list of known Bahamian algae now embraces 525 species, 6 speciés having been recognized since the Bahama Flora went to press. The known species are distributed in the principal groups as follows:

| | | | | | |
|---|---|---|---|---|---|
| Rhodophyceae | 157 | species, | representing | 68 | genera |
| Phaeophyceae | 34 | " | " | 16 | " |
| Chlorophyceae | 96 | " | " | 40 | " |
| Myxophyceae | 62 | " | " | 27 | " |
| Diatomaceae | 176 | " | " | 39 | " |
| Total | 525 | " | " | 190 | " |

One difficult group of red algae, the Squamariaceae, of which much material is available, has not yet been critically studied, and several additions to the list may be expected from this family. There are also various minute epiphytes and endophytes that need more attention. And most of the collecting in the Bahamas has been done in the winter and spring months, when conditions as to temperature and mosquitoes are the most agreeable. Some of the marine algae have a narrowly seasonal appearance and a curiously local distribution. With more extensive and intensive collecting, covering all of the months of the year, it is certain that the above list will be materially enlarged.

A. B. STOUT,
*Secretary of the Conference.*

## NOTES, NEWS AND COMMENT

Dr. and Mrs. N. L. Britton, Dr. Walter Mendelson, and Miss Dorothy Coker returned from Trinidad, May 2, bringing with them a large collection of specimens.

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Professor Guy West Wilson, formerly employed at the Garden, has returned to the department of biology in Upper Iowa University, Fayette, Iowa. While at Clemson College in South Carolina, he collected a number of interesting fungi, an account of which will soon appear in *Mycologia*.

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A widespread leaf-spot disease of the broad-leaved species of *Iris* has been reported from Wisconsin, California, New York, England, and elsewhere. The fungus passes the winter in the dead leaves, producing spores in the spring, which are distributed to new Iris leaves as they develop. Entrance into the leaf is through the breathing pores, the spores germinating on the surface and sending out mycelial threads which elongate until they reach the pores. The removal of dead infected leaves before the young leaves appear promises to be a successful means of control.

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Mr. H. W. Becker, in charge of the Garden greenhouses, has had especial success in the control of ants. His method is by the use of nicotine, applied near their runways, on stems of plants, etc. He is sending a discussion of this to the *Gardeners' Chronicle*.

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## ACCESSIONS

### PLANTS AND SEEDS

7 plants for conservatories. (By exchange with U. S. Nat. Mus., through Dr. J. N. Rose.)

2 plants of *Coryphantha nivosa*. (By exchange with Mr. W. C. Fishlock.)

1 plant for conservatories. (By exchange with Dr. J. W. Harshberger.)

249 plants derived from seed.

7 bulbs of *Scilla maritima*. (Given by Dr. H. H. Rusby.)

5 bulbs of *Lilium superbum*. (Given by Mr. W. F. Marsh.)

2 bulbs of *Allium*. (Given by Mr. R. E. Dale.)

3 bulbs for conservatories. (Given by Mr. W. C. Fishlock.)

26 clumps of *Dahlia* roots. (By exchange with Mr. F. P. Quinby).

8 orchids for the conservatories. (By exchange with U. S. Nat. Mus., through Dr. J. N. Rose.)

2 plants of *Echeveria*. (By exchange with U. S. Nat. Mus., through Dr. J. N. Rose.)

45 cactus plants for the conservatories. (By exchange with U. S. Nat. Mus., through Dr. J. N. Rose.)

4 plants of *Opuntia*. (By exchange with U. S. Nat. Mus., through Dr. J. N. Rose.)

5 plants of *Mamillaria*. (By exchange with U. S. Nat. Mus., through Dr. J. N. Rose.)

1 plant of *Opuntia Lindheimeri*. (By exchange with U. S. Nat. Mus., through Dr. J. N. Rose.)

5 plants of *Pelecyphora pectinata*. (By exchange with U. S. Nat. Mus., through Dr. J. N. Rose.)

1 packet seed. (Given by Dr. H. H. Rusby.)

1 packet seed of *Magnolia acuminata*. (Given by Mr. Inglis Stuart.)

37 packets of seed. (Given by Mr. F. W. Lonegren.)

1 packet of seed. (Given by Mr. McDougal Hawks.)

14 packets of Colombia seed. (Given by Dr. Alexander Andrade.)

11 packets of seed from Ecuador. (Collected by Dr. J. N. Rose.)

2 packets of Florida seed. (Collected by Dr. J. K. Small.)

63 packets of seed. (Purchased.)

3 packets of seed. (By exchange with Director of Hort. Section, Giza Mouderish, Egypt.)

6 packets seed. (By exchange with the U. S. Nat. Mus., through Dr. J. N. Rose.)

169 packets of seed. (By exchange with Botanic Garden, Ottawa, Canada.)

3 packets of seed. (By exchange with Bureau of Plant Industry.)

1 packet seed. (By exchange with Royal Botanic Garden, Kew.)

1 plant of *Ardisia crenulata*. (Given by Mr. George Friedhof.)

8 plants from Florida. (Collected by Dr. J. K. Small.)

1 plant of *Guzmania*. (Given by Mr. Toussaint through Dr. J. K. Small.)

2 plants of *Psychotria bacteriophila*. (By exchange with U. S. Dept. of Agric.)

10 bulbs from Florida. (Collected by Dr. N. L. Britton.)

5 ferns from Florida. (Collected by Dr. N. L. Britton.)

1 pkt. of seed of *Oenothera canescens*. (Given by Miss E. M. Kittredge.)

1 pkt. of seed of *Potentilla sulphurea*. (Given by Bro. J. Peter.)

1 pkt. of seed of *Agave cupreata*. (By exchange with Dr. Wm. Trelease.)

1 pkt. of seed of *Crambe maritima*. (By exchange with Mr. Wm. Auld through Dr. J. K. Small.)

1 pkt. of seed of *Warea Carteri*. (Collected by Dr. N. L. Britton.)

1 pkt. of seed of *Zamia floridana*. (Collected by Mrs. N. L. Britton.)

## MUSEUMS AND HERBARIUM

12 specimens of orchids for the local herbarium. (Given by the Rev. H. M. Denslow.)

1 specimen of *Clastobryum americanum* from Jamaica. (By exchange with Mr. L. J. Pessin.)

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EDITOR

H. A. GLEASON

*Assistant Director*

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## A BOTANICAL EXPEDITION TO TRINIDAD

TO THE SCIENTIFIC DIRECTORS OF THE NEW YORK BOTANICAL GARDEN.

*Gentlemen:* By permission of the Board of Managers, I was occupied during the period from February 16 to May 2, 1920, in making collections for the museums, herbarium and greenhouses on the island of Trinidad, British West Indies. I was accompanied by Mrs. Britton, Dr. Walter Mendelson of the Garden Corporation, Professor Tracy E. Hazen of Barnard College, Miss Dorothy Coker and Mr. William R. Rowland. All participated in the work of collecting and preserving specimens, seeds and plants and this coöperation made possible the formation of a very large and valuable series of Trinidad plants which will enrich our representation of the flora of tropical America and the study of which will be an important contribution to the coöperative botanical investigation of northern South America and islands adjacent now being prosecuted by us with the United States National Museum and the Gray Herbarium of Harvard University.

Drs. Mendelson and Hazen were the official photographers of the expedition and they obtained several hundred negatives, many of which will be of value as records and for purposes of illustration. Those taken by Dr. Mendelson are mostly more humanistic than those by Dr. Hazen, who used up films and plates on botanical subjects with enthusiastic prodigality.

Dr. Mendelson was the voluntary medical officer for the party, but his services in this capacity, while gratefully accepted, were at no time required, the party maintaining increasingly good health; he found however, congenial opportunity, for medical discussions with others of his profession. Dr. Hazen gave especial attention to the collection of algae.

Sailing from New York February 16, under arctic conditions, on the steamship "Mayaro" of the Trinidad Shipping and Trading Company, ice and snow were soon left behind and the voyage proceeded with gradually rising temperatures over quiet seas. The little low island Sombrero, on the eastern side of the Anegada Channel, passed to port in the early morning of the sixth day out, is the first land sighted on this course, Anegada lies some forty-five miles to the west, and although invisible was much in my mind, recalling my interesting visit there with Mr. Fishlock in 1913.[1] During this sixth day of the trip, Dog, Anguilla and St. Martins Islands were passed on the port side, Saba very close on the starboard, St. Eustatius, St. Kitts and Nevis successively more distant, but visible, to port. St. Martins and St. Kitts brought pleasant recollections of my trip with Mr. Cowell in 1901.[2] No more land was seen until the numerous little Grenadine Islands were sighted, on this trip in the very early morning of the eighth day out, soon followed by Grenada, where the "Mayaro" came to anchor before breakfast time in the beautiful harbor of St. George at the southwest side of the island. We thus voyaged from near St. George, Staten Island, to St. George, Grenada, and from boreal to tropical environment.

The cargo gave us nearly a full day ashore on Grenada, enabling us to visit and study the charming botanical garden, located but a short distance from the port, and containing many perfect and beautiful specimens of tropical trees and other plants. Mr. Robert O. Williams, the Director, received us with great cordiality, and escorted us to points of botanical interest, enabling me to study and collect several of the native species of cacti, thus obtaining information which will be of service in my investi-

[1] Journ. N. Y. Bot. Gard. 14: 99–109. 1913.
[2] Journ. N. Y Bot. Gard. 2: 161–166. 1901.

gation of these plants with Drs. J. N. Rose and D. T. MacDougal of the Carnegie Institution of Washington.

We arrived at Port of Spain, Trinidad, on the morning of February 25. Comfortable and convenient arrangements for our stay had been made by Miss Minerva Hart, Librarian of the Public Library and a daughter of the late John Hart, Director of the Trinidad Botanical Garden from 1887 to 1911, and to her we are indebted for much information, advice and assistance, during our visit. Our work was made easy and delightful through the valued coöperation of Mr. W. G. Freeman, Director of Agriculture, and all the members of his staff, who continually facilitated our operations in ways too numerous to mention.

Trinidad, with a land area of 1,974 square miles, is in a general way oblong, some 50 miles long north and south and some 30 miles wide, with a narrowing peninsula about 30 miles long projecting from the southwestern part and a shorter peninsula tipped by the several small Bocas Islands at the northeastern corner. A chain of hills and mountains with very steep slopes rising to elevations of a little over 3,000 feet, mostly of schists and hard limestones, perhaps of Jurassic or Cretaceous age, extends along the whole northern side, followed to the south by a broad low valley; a central range of hills with several isolated ones obliquely traverses the central part of the island from southwest to northeast with a line of elevations running off to the southeast; undulating and nearly level country occupies the south-central part and there is a long hill-system more or less parallel with the southern coast. With the exception of a few isolated hills all parts of the island south of the northern mountain range are supposed to be of Tertiary geological age or more recent. The river-system is extensive, of many small streams and brooks; there are three principal lagoon and swamp areas of considerable size; sea-beaches are numerous on the eastern and southern coasts, but elsewhere only local and small.

The forest area is extensive, composed of many species of trees, occupying at least one fourth of the island and much of it is held as government reserves and crown-lands, assuring an abundant fuel supply and the regulation of the flow of rivers

and streams, in which respect Trinidad is much better off than Porto Rico and the Virgin Islands. An enlightened policy has further provided an efficient system of forest protection, and of reforestation with valuable timber-trees; we are indebted to Mr. C. S. Rogers, Chief Forest Officer, for advice and information.

Savannas of considerable size occur in several districts, grassy areas often with scattered shrubs and small trees and highly specialized herbaceous vegetation; these are not only on plains, but also, locally on steep hillsides, and they differ a good deal in their component plants, many of the rarer and most interesting species being restricted in distribution. The soil of these savannas is for the most part not adapted to cultivation.

The road-system is elaborate and is excellently maintained, making it possible to visit nearly all parts of the island with dispatch and facility. Many miles of forest are traversed by roads, providing sections well adapted to the study of the native trees and other plants; most of the savanna areas are also crossed by roads and the coasts may be reached on them at many localities. The higher altitudes cannot, however, be reached by vehicles, but bridle paths lead high up at many points; the excellent mountain roads of Porto Rico, upon which transition from the hot lowlands to cool and breezy elevations of 2,000 feet and more is rapid, are not yet duplicated in Trinidad, but the orographic features of the two islands are dissimilar.

The distribution of the native plants here as elsewhere is for the most part dependent upon rainfall, soil, and altitude. The wettest parts of Trinidad are toward the northeastern side, where the trade-winds first impinge upon the northern mountain range and here the forests are most luxuriant. The driest parts are the Bocas Islands and the contiguous mainland of the northwestern coast, where the trees are small and cacti abound, as also a species of *Agave*. The higher elevations of the northern mountain range have a number of species not found below. The flora of the southwestern peninsula contains many species not found elsewhere upon the island. A detailed survey of the distribution of plants with relation to rainfall, soil, and altitude would be of great scientific value.

Our first collections were made at Carenage, on the north-eastern coast, on the afternoon of our arrival and on the next day at Cocorite, nearby, where numerous herbaceous species and cryptogams were found. On February 27th we visited the Piarco Savanna on the plain south of Arouca and obtained specimens of many characteristic savanna plants. A little *Drosera*, a *Polygala*, and an *Oldenlandia* reminded us of similar areas in the southeastern United States; adjacent woodlands contained many kinds of trees, shrubs and ferns, and lichens were abundant on the bark of trees and shrubs. Saddle Road, which crosses the hills near Port of Spain, was traversed on February 28 and here, among other interesting species, we first came close to the tree which forms striking gray patches on the hills above Port of Spain, and were surprised to find it a gigantic species of *Croton* (*C. gossypifolius*) attaining dimensions of a tree up to 50 feet high with a trunk a foot in diameter. With it were many trumpet-trees (*Cecropia*), their large leaves white beneath; and the bois immortelle (*Erythrina*), a tall tree introduced from northern South America for shading cocoa plantations, filled the valleys with glorious masses of orange flowers which appear before the leaves.

The care of the collections, and studies in the botanical garden and in the herbarium occupied our time for the most part for the next three days. On March 3, we visited Maqueripe, a beautiful little bay on the northern coast with a good bathing beach, and made considerable collections on rocky-wooded hillsides. Here a *Begonia* reaching 5 feet in height and the scarlet-flowered *Aphelandra* were striking floral features. Returning to Port of Spain, we first saw, near Carenage, the striking purple flowers of the Trinidad *Securidaca*, a vine of the Gay-wings Family, forming long wands.

On March 4, we drove through the Maracas and Acono Valleys to Ortinola Estate, where we were hospitably entertained by Mr. and Mrs. Stanhope Lovell, and collected many specimens along a clear mountain stream which flows through a cocoa plantation, including many ferns and mosses, and herewe first made the acquaintance of the showy white-spathed aroid *Spathi-*

*phyllum* and the curious herbaceous *Dorstenia* of the Mulberry Family.

The Aripo Savanna at Cumuto, which we visited on March 5, under the guidance of Mr. W. E. Broadway, Horticulturist and Assistant Botanist of the Trinidad Department of Agriculture, supports one of the most fascinating botanical associations ever studied by us. Over several hundred acres it simulates a northern meadow, with a large variety of grasses and sedges; several terrestrial bladderworts, yellow, white, and purple, the little white *Burmannia*, four kinds of ground orchids, a *Lycopodium*, two species of *Xyris*, and several herbaceous purple-flowered plants related to our Rhexias occur among the grasses and were eagerly collected. The savanna is enclosed by forests composed of a great variety of trees and shrubs; the stately palm *Mauritia* with its highly ornamental fruits, the graceful manac palm (*Euterpe*), and the showy rose-flowered *Isertia*, a small tree related to *Cinchona*, were of special interest, and many ferns, orchids, mosses, lichens, and fungi were also obtained.

March 6 and 7 were occupied in preserving the collection and in herbarium and garden studies, and March 8 and 9 were spent on a trip to the northeastern coast arranged for us by Mr. Freeman. The Mora Forest a few miles east of Sangre Grande is one of the most luxuriant, containing trees of great size, the Mora (*Dimorphandra excelsa*) and the Balata (*Mimusops Balata*) among the largest, with many high-climbing aroids (*Philodendron*) and other lianas. Large forest areas near Balandra Bay were also studied, and here we first encountered the very spiny climbing palm *Desmoncus* and the equally spiny slender cuesa palm (*Bactris cuesa*) and its relative *Bactris major*, both in fruit, with fruits very unlike. Climbing *Lygodium* ferns are abundant here; the very large sedge *Diplazia* with bright white flowers was conspicuous, and the woods yielded many ferns, mosses and other cryptogams. We are indebted to Mr. Frank Meungot for the use of his house at Balandra Bay and to Mr. and Mrs. E. A. Robinson of Nonpareil Estate for aid and hospitality, for the privilege of visiting their great plantation of Para rubber trees, the largest in Trinidad and one

of the largest in tropical America, and for a fine museum specimen of the rubber produced.

On March 10, after attention had been given to our rapidly increasing collection, a late afternoon drive was taken over the new Lady Chancellor Road, partly constructed over the rather dry hills north of Port of Spain and affording fine views of the city and the roadstead; here we first saw the locust-like tree *Coursetia arborea* in flower, blooming before its leaves appear, and the slender tree *Heliocarpus* of the Linden Family, also bare of leaves, but retaining its super-abundant little flat fringed fruits.

An examination of the vegetation of the Bocas Islands and adjacent Trinidad mainland was made from March 11 to March 14, using the staunch motor-launch "Marie," with a hotel on Gasparee Island as a base of operations. This region is wholly of rocky schistose and limestone hills, with very steep slopes and nearly vertical cliffs, and increasingly arid as followed from east to west. On the mainland at Teteron Bay, coastal banks and hillsides were studied; a fragrant yellow-flowered *Ouratea*, a shrub of the Ochna Family, was of special interest, an apparently native cotton (*Gossypium*) was found upon a beach, and here our first acquaintance was made with the native "Rose de Montagne" (*Brownea*), a tree of the Pea Family, its bright red flowers appearing in dense clusters on its trunk and branches, sometimes within a foot of the ground. Lichens growing on pure white quartz were collected with much interest. Gasparee Island yielded many lichens, an orange-colored one, covering the surfaces of hard limestone outcrops, being conspicuous, and here we first saw three of the large native cacti, later found in abundance on islands farther west. Monos Island, separated from the Trinidad mainland by the Boca de Monos, is rather densely wooded with small trees of many kinds, at this season of the year mostly leafless, and here we were hospitably received and entertained by Mr. A. A. Siegert. At the top of precipitous cliffs on the northern side we saw the slender palm *Coccothrinax*, subsequently seen in similar situations on the northern mainland, there always in situations extremely difficult of access. An

attempt to land on Huevos Island, separated from Monos by the Boca de Navios, met with failure, owing to heavy seas. We spent a day ashore on Chacachacare Island, separated from Huevos by the Boca de Huevos, where facilities for our work had kindly been provided at the Catholic Presbytery by the Rev. Father Sassen through the interest of Mr. J. E. Scheult, Chief Clerk of the Department of Agriculture. The vegetation of Chacachacare is almost wholly xerophytic; cacti abound at the lower elevations and on cliffs, among them the essentially spineless prickly pear, *Opuntia Boldinghii*, seen also on Patos and apparently indigenous on both islands,[1] together with the native endemic *Agave* (*A. evadens*), which was in full bloom at the time of our visit, its large panicles of bright yellow flowers very conspicuous. Three species of *Capparis*, small trees with white clustered flowers, are abundant.

A special expedition was made under the escort of Mr. Freeman to the small rocky Patos Island, which lies about six miles west of Chacachacare across the Boca Grande and within a few miles of the long, narrow mountainous peninsula of Venezuela. It is inhabited only by a keeper and assistant, whose duties consist in raising and lowering the British flag daily on a pole at the top, at an altitude of about 320 feet. Landing is prohibited, but the Trinidad Government kindly waived this restriction in our case and we had a most interesting day on shore, climbing over the intensely arid hills among the numerous cacti and low shrubs and trees. This is the only place within Trinidad territory where a turks-head cactus, the large cactus *Lemaireocereus* and a slender round, ribbed, arching *Cephalocereus* are known to exist, together with several other species of wide distribution. Few of the shrubs and trees were in bloom at the time of our visit, but collections had previously been made there by Mr. Broadway and R. O. Williams of the Department of Agriculture, under the more favorable conditions of the wet season, so that, collectively, we have a fair knowledge of its plant population,

[1] *Opuntia Boldinghii* Britton & Rose was first found by us in cultivation on Curacao, later on the coast of Venezuela, and had previously been collected on Margarita. See Cactaceae 1: 155. 1919.

which is not extensive as regards number of species. We returned to Gasparee through the high ocean rollers of the Boca Grande, the cacti securely packed in sacks and baskets as a precautionary measure and the whole collection protected against salt water by rubber sheets, while the mere presence of our medical officer effectually prevented mal de mer.

Returning to Port of Spain, we made a rapid transition on March 15 to the dense humid forest four miles east of Arima and there collected specimens of some 60 kinds of plants, not previously observed by us, including many ferns, mosses and other cryptogams, together with orchids and aroids. March 16 was given to the care of the collection and in the afternoon I had the pleasure of addressing the Horticultural Club of Trinidad and Tobago upon the object of our visit and the scope of our investigation. The meeting was held in the Royal Victoria Institute under the Chairmanship of Rev. Archdeacon Arthur Hombersley; His Excellency Sir John Chancellor, Governor of Trinidad, and Lady Chancellor honored us by their attendance, and the Governor made many kind remarks of appreciation; to him and to many other Trinidad officials we are deeply grateful for cordial coöperation.

On March 17, we made collections on the Heights of St. Ann, above Port of Spain. One of the several bracken savannas existing on these hills was studied with interest, the vegetation consisting almost wholly of the tall fern *Pteris caudata*, but a number of herbaceous plants and small trees were observed nearby, as also the curious 3-winged woody fruit of the long vine *Hippocratea;* the tree *Oliganthes*, related to *Vernonia* and reaching 50 feet in height with a trunk up to a foot in diameter, is one of the largest plants of the Composite Family.

On March 18, we traversed another section of the Piarco Savanna and also studied the woods to the south of it near the Caroni River, reaching the region by way of Dabadie. Numerous herbaceous species not seen on our previous visit were collected, among them the small endemic *Lobelia trinitensis;* several Clusias and related trees were seen here, one of them with pure white flowers three inches wide and very beautiful among the dark

green foliage; in a shaded brook we found a white-flowered floating-heart (*Nymphodes*) and a purple-flowered *Cabomba;* one of the native passion-flower vines bore yellow fruits the size and shape of a, hen's egg. Through arrangements kindly made by Mr. Louis Scheult, Manager of the River Estate, we visited North Post, a hill about 600 feet high on the northern coast, on March 19; the signal station for incoming ships is situated here and fine views are had in all directions. Collections were made on hillsides along the road; trees of *Lecythis*, their small fruits like those of the related Brazil-nut, are frequent here, and one of the several kinds of wild figs (*Ficus*), here forest trees, was in full fruit. Coastal hills and marshes at Point Cumana, Carenage and Chaguaramas were studied on March 20. The coastal aroid *Montrichardia aculeata*, a species with an erect more or less prickly stem four or five feet high was found in fruit at Point Cumana and the tree *Mayepaea* of the Olive Family was abundant on dry hills near Chaguaramas. On March 21, we returned to the woodlands near the Caroni River, following the Caroni North Bank Road, and obtained specimens of many plants, mostly cryptogams. A somewhat arduous tramp of some eight miles was taken on March 22, from the North Post Signal Station westward, up and down hill to Maqueripe, but the botanical results were worth the effort, specimens of some seventy species being collected. Climbing to 600 feet elevation at North Post we went down hill to about 200 feet, then up to about 900, down again to sea-level, up to 1,000 feet and down to Maqueripe Bay. Most of the way was through cocoa plantations, but some fine forest areas were traversed; on the hill above Maqueripe we found the beautiful delicate white-flowered fragrant vine *Emmeorhiza* of the Madder Family and the leafless yellow *Leiphaimos trinitensis*, endemic in Trinidad, was collected in leaf-mould of the forest.

Through arrangements made by Mr. Freeman we visited the Government Farm at St. Augustine on March 23 and made collections of many herbaceous plants on marshy land given over to rice cultivation nearby. We were hospitably entertained there by Mr. J. McInroy, Superintendent of the farm, and Mrs.

McInroy. Mr. Broadway guided us the next day to the grassy savanna on the steep hills above St. Joseph, which we climbed up to 1,000 feet. A fruiting tree of *Roupala montana*, the only West Indian representative of the Protea Family, greatly interested us and several herbaceous plants not seen elsewhere were collected. The forest region about Valencia was visited on March 25; here we first saw the Trinidad *Clethra*, a tree up to at least 30 feet in height, and the purple-heart (*Peltogyne*), a very large and valuable forest tree. Three large palms are here luxuriant and abundant, cocorite (*Maximiliana*), timite (*Manicaria*), and palma real (*Oenocarpus*); museum specimens of their fruits were obtained.

From March 26 to March 30, our base was changed to San Fernando, forty miles south of Port of Spain by road, where permission to use the comfortable government building Colony House had kindly been granted us by Hon. T. A. V. Best, Colonial Secretary. The isolated, wooded San Fernando Hill gave us our first acquaintance with the tall palm *Sabal mauritiiformis*, a relative of the Florida palmetto, its large leaves glaucous beneath, and there is here an outlying colony of the large *Cereus hexagonus*. The vegetation of the borders of the wonderful Pitch Lake near La Brea was studied with great interest and specimens of all kinds of plants found there were collected; no species characteristic of the environment were detected, nor have any ever been recorded; the large sedge *Cyperus ligularis*, ordinarily restricted to saline soil, occurs abundantly, however. Under the guidance of Mr. Freeman, studies and collections were made on March 28 in forest areas on the Penal Rock Road west of the Moruga Road, where the large palm *Attalea* grows abundantly, and near the eastern end of the Southern Watershed Reserve, where many cryptogams were obtained; the jigger-tree (*Bravasia*) was in full flower there. We are indebted to Mr. Henry Warner, President of the Agricultural Society, for information and hospitality and for specimens of the red-flowered banana (*Musa coccinea*) grown on his estate on the Moruga Road, its small fruits producing perfect seeds.

The low level lands of the Oropuche Lagoon, dry at this time

of year, were studied on March 29, yielding many kinds of sedges and grasses; the tall *Thalia geniculata* reminded us of Florida. We were delightfully entertained at the large sugar estate Usine St. Madeleine by Mr. Moody Stewart and his family. Under the guidance of Mr. C. B. Williams, Special Investigator of sugar-cane diseases, an excursion was made on March 30 to Palo Seco on the southern coast, where, among many other interesting trees and shrubs, the *Coccothrinax* palm was found in great abundance on hillsides facing the sea, its dense bunches of small black fruits very characteristic. One of the "mud-volcanos" was visited, and the great amount of earth which had flowed from it, covering the whole floor of a broad valley extending to the sea, was very impressive. We had previously studied a much smaller one near the Penal Rock Road.

Mr. Williams guided us also to a large quarry near Siparia, the rock excavated being widely used for road-metal; it is the argillaceous shale porcelainite, quite hard, and contains enormous quantities of fossil leaf impressions and other plant remains. This plant bed is of great extent and thickness; it is exposed in this quarry to a depth of at least sixty feet and is packed with leaf-impressions nearly throughout. Here must certainly exist the key to the ancestry of a large part of the Trinidad flora and the palaeontological information to be obtained from an intensive study of the fossils would be of high scientific importance. We collected some specimens, but much more time than was at our disposal would be required to obtain a satisfactory representation of the material.

Returning to Port of Spain, our next extensive collecting was accomplished on April 1, in the Caura River Valley, which yielded many mosses and lichens, and on the beautiful Arcadia Estate of Mr. Robert Henderson at Veronica, where we were cordially received and guided by Mr. F. C. Buthn, Manager, after introduction by Mr. F. W. Urich, Entomologist of the Board of Agriculture. Wooded hillsides there contain many interesting trees and shrubs; the lovely white flowers of *Samyda* were here first seen by us and the flat-stemmed cactus *Epiphyllum Hookeri* was in bloom, forming large masses on trees; charming mountain

views are had from the higher elevations. Mr. Buthn kindly granted our request for aid in the exploration of Mount Tocuche by furnishing men and mules and our ascent of this mountain, a Mecca for all naturalists visiting Trinidad, was organized for the morning of April 3, some of the party proceeding from Arcadia others from Ortinola, where similar cordial coöperation had been granted by Mr. J. P. Bain. Mr. Freeman, who was well acquainted with the route, led the Ortinola contingent, and brought two men from the Botanical Garden as general helpers.

Mount Tocuche is situated in the Northern Mountain Range Reserve north of the Maracas Valley and about three miles from the northern coast at Las Cuevas Bay. It rises to about 3,100 feet altitude, with very steep slopes. Cocoa plantations extend to about one half way up, but above them is unbroken forest of great beauty and of extreme interest. The ascent from the Caura Valley is over the well-graded Tocuche Bridle Road, about twelve and one half miles, which was reduced from Arcadia by short and steep cut-offs to about nine miles. From Ortinola the distance is not more than six miles, but part of it is too steep for animals to traverse. The two divisions of our party came together on the Tocuche Road about three miles from the summit, after a large fallen tree had been cut from across the road, causing some delay. There are several waterfalls in valleys near this point, the surrounding vegetation forming attractive natural gardens. Collections of many kinds of plants were made along the route travelled and the summit was reached about the middle of the afternoon. There is a small two-roomed government rest-house on the top, and the forest has been cleared off immediately around it, long-distance views thus being had in all directions. Its furniture comprises tables and benches only, but Mr. Freeman had brought camp-beds for the ladies, while the male contingent slept on floor-beds based on *Hemitelia* and *Dicranopteris* ferns, or on the benches; the relative hardness of ferns and benches was not determined, but everybody claimed to have slept well during the two nights of occupancy, disturbed only by the strong trade-wind which blew almost continuously. The temperature fell rapidly immediately after

sunset, reaching about 60° F. during the night, but we were prepared for this, and the whole experience was thoroughly enjoyed; no rain fell during the three days, which was pronounced unusual by those who knew the mountain. The flora is very rich and varied; we collected specimens of about 300 species, including trees, shrubs, herbaceous plants, ferns, mosses and lower cryptogams. Ferns are very abundant, from delicate filmies, of which fifteen kinds were obtained, to large tree-ferns of half a dozen species. The curious mountain representative of the Bladderwort Family (*Arcylium*) strikingly simulating a ground orchid, is locally plentiful on wet banks; a delicate blue-flowered little *Burmannia*-relative inhabits leaf-mould; a slender climbing bamboo-grass (*Arthrostylidium*) ascends trees; scarlet-flowered and white-flowered vines of the Heath Family are present in three species; a high-climbing *Senecio* bears showy yellow flowers; many orchids and bromeliads are perched on trees and rocks; the vine *Marcgravia elegans* festoons the trees, as also the climbing *Begonia scandens*, while a large white-flowered *Begonia* is abundant on banks and cliffs. We returned to Port of Spain richly laden and the care of the large collections made required two full days.

On April 7, Mr. Broadway accompanied us to the O'Meara Savanna south of Arima, where additional savanna herbaceous species were obtained and the smaller climbing palm *Desmoncus* was found growing on cocorite palms. We collected a few specimens the next day on the Caura Valley Road. On April 9, we went to Maraval and up the Morne Cocoa Road. On April 10, we visited the justly celebrated Maracas Waterfall, guided by Mr. C. B. Williams and Miss Nettie Bain; this is certainly a remarkable and beautiful cascade, a small river falling over vertical cliffs from a great height, said to be about 400 feet, ending in spray which moistens the vegetation over a considerable area. Here we made a large collection, including many ferns and mosses. A species of *Tabernaemontana*, a shrub of the Dogbane Family, bore interesting white flowers, their corolla-lobes arching upward and connivent, instead of widely spreading as in most species; a tree-*Solanum* there is an

unusual development in its family and the rocks and banks are carpeted with a trailing *Hydrocotyle*, one of the very few plants of the Carrot Family native in Trinidad; the cliffs are clothed with the large white-flowered *Begonia*, a large bromeliad with tall red branching inflorescence, and other plants.

A second visit was made to the Bocas Islands and the adjacent Trinidad mainland April 12 to 14, again using the launch "Marie" for transportation and the hotel on Gasparee Island as a base. This trip was especially planned for a further study of the cacti, and additional miscellaneous collections were made at Scotland Bay, Monos, Gasparee and Chacachacare Islands and at Belleview. On Chacachacare we walked up to the lighthouse situated at over 900 feet elevation; *Steriphoma*, a tree of the Caper Family, was conspicuous on the hillsides by its orange flowers. At La Tinta Bay, where we were hospitably received by Captain Mendes, we collected *Sophora tomentosa*, a seaside shrub of the Pea Family, a common West Indian species, known only at this point in Trinidad. Captain Mendes guided us to a wonderful colony of a *Sargassum*, the plants all firmly attached to the rocky bottom of a pool and very different from the pelagic species of the open ocean. At Belleview the cochineal cactus (*Nopalea*) was found in abundance, forming thickets on a dry coastal hillside, an unusual habit for the plant to assume; it is usually seen singly or few together near houses where it has been planted. As one of the long-cultivated plants whose natural habitat is unknown, this occurrence is of considerable interest, but we could not satisfy ourselves that the plant is native here, as we saw ruins of a house nearby.

Collections were made in the Dibe Valley on April 15, including the golden yellow flowers of the *Tabebuia* trees, elegant and conspicuous on the hillsides, blooming before their palmately compound leaves appear; the bitter-wood (*Quassia amara*) is occasional here, its bright red, racemose flowers very attractive, and numerous ferns and mosses were obtained. The Valencia forests were again explored on April 16, at points on the Toco Road, and proved to be even richer in species, especially cryptogams, than our first examination of them had indicated; we

brought out specimens under 131 field numbers, and the day's work was one of the most interesting of the expedition. The elegant vine *Findlaya*, of the Heath Family, drooped in masses from the trees, its young foliage red, its flowers scarlet; the tree *Palidcourea* with large panicles of orange-yellow pedicels and white corollas was striking and attractive; an epiphytic *Columnea* with yellow flowers hung from a tree; several of the numerous large parasitic plants of the Mistletoe Family were obtained, and a rare little *Schizaea* fern was detected in sandy woods, reminding us of our diminutive New Jersey curly grass, although three times as large.

The beautiful pool and cascade of Blue Basin and surroundings were visited from the River Estate on April 17, under guidance and hospitality of Mr. Louis Seheult and his family. Access is over a path rising several hundred feet and reaching wooded slopes in the northern mountain range; the vertical cliffs of the basin are clothed with ferns, begonias and mosses. The tall cannon-ball tree (*Couroupita*), much planted in the lowlands, grows wild on the hills; its hard globular fruits, up to six inches in diameter, borne after the large curious irregular flowers, on leafless branches from the lower part of the trunk, are internally malodorous; a fine example of one of the wild figs strangling a tree of another kind was seen along the path.

April 18 was given to a study of the vegetation of Mount Tamana, a steep-sloped isolated hill of hard limestone near the middle of the island, in a district of rather high rainfall. Its height is recorded as 1,100 feet; its summit and upper slopes are densely forested. Large incense trees (*Icica*) with fragrant wood and *Pterocarpus*, a tree of the Pea Family with flat, winged, one-seeded pods, are abundant; here is the type locality for the slender little palm *Geonoma vaga*, found both in flower and in fruit, and a pedate-leaved climbing aroid of the genus *Philoden-dron* is frequent, with several kinds of tree-climbing ferns. Cocoa plantations at the base of the mountain yielded many kinds of small epiphytic orchids, mosses and lichens.

Two days were now required for the care and packing of the

collections and for herbarium studies, and our final excursion was made with Mr. Freeman on April 21 to the Aripo Savanna, revisited in order to see the elusive *Schizaea pennula* and to find the fruit of the slender, white-spined, immoderately armed *Bactris* palm of that locality, both of which errands were successful, while other interesting species were also collected. We sailed from Port of Spain on April 23, touched at Grenada the next morning but without time to land, and arrived in New York, after a delightful voyage on the "Mayaro," on May 2. Our large collections of specimens and plants including 2,017 field numbers and aggregating over 6,000 specimens, together with some 2,000 others collected in former years by Mr. Broadway and several hundred duplicates obtained in exchange from the Department of Agriculture, and many algae collected by Professor Hazen were brought with us in good condition; Professor Hazen proceeded later by steamer to Europe, for algological studies during the summer.

The Department of Agriculture of Trinidad and Tobago has its head office and herbarium at the St. Clair Experiment Station close to the beautiful botanical gardens facing the Queen's Park Savanna at Port of Spain, also under its management. The gardens are rich in species of tropical plants, the large collection of palms being especially noteworthy; they date from the year 1818, and have been successively administered as a very important and useful horticultural and botanical institution by Daniel Lockhart (1818–1846), William Purdie (1846–1857), Hermann Crueger (1857–1864), Henry Prestoe (1864–1886), John Hinchley Hart (1887–1911) and since 1912 by William George Freeman, the present Director of Agriculture. The publications of the gardens and of the Department are extensive and valuable; our series of them was quite incomplete, but I obtained many of the parts missing in our library in exchange for parts of our *Bulletin* and our JOURNAL lacking in Trinidad. The herbarium of the Department is the largest and most valuable collection of its kind in tropical America, and is in an excellent condition of preservation, thanks largely to the unremitting care of Miss

Pauline McClean, who has been herbarium assistant for over thirty-two years.

Respectfully submitted,

N. L. BRITTON,
*Director-in-Chief.*

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## SUMMER LECTURES, 1920

Free Public Lectures will be delivered in the Lecture Hall of the Museum Building of the Garden, Bronx Park, Saturday afternoons, at four o'clock, as follows:

July 3. "A Brief Description of the New York Botanical Garden," by Dr. W. A. Murrill.

July 10. "Summer Wild Flowers," by Dr. N. L. Britton.

July 17. "Spoilage of Fruits and Vegetables During Transportation and Storage," by F. C. Meier.

(Exhibition of colored photographs illustrating market diseases.)

July 24. "The State Park at Devil's Lake, Wisconsin," by Dr. A. B. Stout.

July 31. "Flowers for the Summer Garden," by Mr. G. V. Nash.

Aug. 7. "Diatoms—Plants of Beauty Seen Through a Microscope," by Dr. M. A. Howe.

Aug. 14. "Through the Philippines with a Kodak," by Dr. H. A. Gleason.

Aug. 21. "How to Know, Gather, and Cook the Puffballs," by Dr. W. A. Murrill.

(Exhibition of Gladioli, August 21 and 22.)

Aug 28. "A Trip to Colorado," by Dr. F. J. Seaver.

The lectures, which occupy an hour, will be illustrated by lantern slides and otherwise. Doors closed at 4:00; late-comers admitted at 4:15.

# HARDY WOODY PLANTS IN THE NEW YORK BOTANICAL GARDEN

(*Concluded*)

**Lonicera dioica.** GLAUCOUS HONEYSUCKLE.
Location: Viticetum.
Natural distribution: Northeastern North America.

**Lonicera flava.** YELLOW HONEYSUCKLE.
Location: Viticetum.
Natural distribution: Southeastern United States.

**Lonicera fragrantissima.** FRAGRANT HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: China.

**Lonicera gracilipes** var. **glabra.** ONE-FLOWERED HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Japan.

**Lonicera iberica.** IBERIAN HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Transcaucasia and Persia.

**Lonicera japonica.** JAPANESE HONEYSUCKLE.
Location: Viticetum.
Natural distribution: China and Japan.

**Lonicera japonica** var. **Halliana.** HALL'S JAPANESE HONEYSUCKLE.
Location: Viticetum.

**Lonicera japonica** var. **flexuosa aureo-reticulata.** GOLDEN-VEINED HONEYSUCKLE.
Location: Fruticetum.

**Lonicera Koralkovii** var. **floribunda.** KORALKOW'S MANY-FLOWERED HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Turkestan.

**Lonicera Maackii.** MAACK'S HONEYSUCKLE.
Location: Fruticetum.
Natural distribution: Northeastern Asia to central Japan.

**Lonicera Maackii** var. **erubescens.** MAACK'S PINK-FLOWERED HONEYSUCKLE.

Location: Fruticetum.

**Lonicera Maximowiczii.** MAXIMOWICZ'S HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Northeastern Asia.

**Lonicera minutiflora.** SMALL-FLOWERED HONEYSUCKLE.

Location: Fruticetum.

Horticultural origin.

**Lonicera Morrowi.** MORROW'S HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Japan.

**Lonicera Morrowi** var. **xanthocarpa.** MORROW'S YELLOW-FRUITED HONEYSUCKLE.

Location: Fruticetum.

**Lonicera muendeniensis.** MUENDEN HONEYSUCKLE.

Location: Fruticetum.

Horticultural origin.

**Lonicera muscaviensis.** MUSKAU HONEYSUCKLE.

Location: Fruticetum.

Horticultural origin.

**Lonicera Periclymenum** var. **belgica.** BELGIAN WOODBINE.

Location: Fruticetum.

Natural distribution: Europe.

**Lonicera Ruprechtiana.** RUPRECHT'S HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Manchuria.

**Lonicera segreziensis.** SEGREZ HONEYSUCKLE.

Location: Fruticetum.

Horticultural origin.

**Lonicera Standishii.** STANDISH'S HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: China.

**Lonicera Standishii** var. **lancifolia.** STANDISH'S NARROW-LEAVED HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Western China.

**Lonicera Sullivantii.** SULLIVANT'S HONEYSUCKLE.

Location: Viticetum.

Natural distribution: Northeastern United States and Ontario.

**Lonicera syringantha.** LILAC-FLOWERED HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Western China.

**Lonicera syringantha** var. **Wolfii.** WOLF'S LILAC-FLOWERED HONEYSUCKLE.

Location: Fruticetum.

**Lonicera tatarica.** SIBERIAN HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Southeastern Russia to Siberia.

**Lonicera tatarica** var. **speciosa.** PINK-FLOWERED SIBERIAN HONEYSUCKLE.

Location: Fruticetum.

Horticultural origin.

**Lonicera xylosteoides.** BLUISH HONEYSUCKLE.

Location: Fruticetum.

Hybrid.

**Lonicera Xylosteum.** FLY HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Europe and western and northern Asia.

## **Diervilla.** BUSH HONEYSUCKLE

**Diervilla Diervilla.** BUSH HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Northeastern North America.

**Diervilla rivularis.** HAIRY BUSH HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Southeastern United States.

**Diervilla sessilifolia.** SESSILE-LEAVED BUSH HONEYSUCKLE.

Location: Fruticetum.

Natural distribution: Southeastern United States.

## **Weigela.** WEIGELA

**Weigela coraeënsis.** COREAN WEIGELA.

Location: Fruticetum.

Natural distribution: Japan.

**Weigela floribunda.** MANY-FLOWERED WEIGELA.
Location: Fruticetum.
Natural distribution: Japan.
**Weigela florida.** ROSE WEIGELA.
Location: Fruticetum.
Natural distribution: Northern China.
**Weigela florida** var. **candida.** WHITE CHINESE WEIGELA.
Location: Fruticetum.
**Weigela hybrida** var. **Abel Carriere.** WEIGELA ABEL CARRIERE.
Location: Fruticetum.
Hybrid.
**Weigela hybrida** var. **Avalanche.** WEIGELA AVALANCHE.
Location: Fruticetum.
**Weigela hybrida** var. **Avant Large.** WEIGELA AVANT LARGE.
Location: Fruticetum.
**Weigela hybrida** var. **Bouquet Rose.** WEIGELA BOUQUET ROSE.
Location: Fruticetum.
**Weigela hybrida** var. **Buisson Fleur.** WIEGELA BUISSON FLEUR.
Location: Fruticetum.
**Weigela hybrida** var. **candida.** WHITE HYBRID WEIGELA.
Location: Fruticetum.
**Weigela hybrida** var. **Conquete.** WEIGELA CONQUETE.
Location: Fruticetum.
**Weigela hybrida** var. **Dame Blanche.** WEIGELA DAME BLANCHE
Location: Fruticetum.
**Weigela hybrida** var. **Desboisii.** DESBOIS' WEIGELA.
Location: Fruticetum.
**Weigela hybrida** var. **Esperance.** WEIGELA ESPERANCE.
Location: Fruticetum.
**Weigela hybrida** var. **Eva Rathke.** WEIGELA EVA RATHKE.
Location: Fruticetum.
**Weigela hybrida** var. **Fleur de Mai.** WEIGELA FLEUR DE MAI.
Location: Fruticetum.
**Weigela hybrida** var. **Floreal.** WEIGELA FLOREAL.
Location: Fruticetum.
**Weigela hybrida** var. **Fraicheur.** WEIGELA FRAICHEUR.
Location: Fruticetum.

**Weigela hybrida** var. **Glorieux.** WEIGELA GLORIEUX.
Location: Fruticetum.

**Weigela hybrida** var. **Gracieux.** WEIGELA GRACIEUX.
Location: Fruticetum.

**Weigela hybrida** var. **Gustave Mallet.** MALLET'S WEIGELA.
Location: Fruticetum.

**Weigela hybrida** var. **Herione.** WEIGELA HERIONE.
Location: Fruticetum.

**Weigela hybrida** var. **Isoline.** WEIGELA ISOLINE.
Location: Fruticetum.

**Weigela hybrida** var. **Lavallei.** LAVALLÈ'S WEIGELA.
Location: Fruticetum.

**Weigela hybrida** var. **Le Printemps.** WEIGELA LE PRINTEMPS.
Location: Fruticetum.

**Weigela hybrida** var. **Messager.** WEIGELA MESSAGER.
Location: Fruticetum.

**Weigela hybrida** var. **Perle.** WEIGELA PERLE.
Location: Fruticetum.

**Weigela hybrida** var. **Seduction.** WEIGELA SEDUCTION.
Location: Fruticetum.

**Weigela hybrida** var. **Sieboldii argenteo-variegata.** SILVER-MARGINED WEIGELA.
Location: Fruticetum.

**Weigela hybrida** var. **Stelzneri.** STELZNER'S WEIGELA.
Location: Fruticetum.

**Weigela hybrida** var. **Van Houttei.** VAN HOUTTE'S WEIGELA.
Location: Fruticetum.

**Weigela hybrida** var. **Vestale.** WEIGELA VESTALE.
Location: Fruticetum.

**Weigela japonica.** JAPANESE WEIGELA.
Location: Fruticetum.
Natural distribution: Japan and China.

**Weigela japonica** var. **hortensis.** GARDEN WEIGELA.
Location: Fruticetum.

CARDUACEAE. Thistle Family

**Baccharis.** PENCIL-TREE

**Baccharis halimifolia.** PENCIL-TREE.

Location: Fruticetum.

Natural distribution: Southeastern United States.

GEORGE V. NASH.

## NOTES, NEWS AND COMMENT

Dr. Perley Spaulding, of the United States Department of Agriculture, spent two days at the Garden in May examining literature in the Garden library.

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Prof. H. M. Fitzpatrick, of Cornell University, visited the Garden for several days in May in continuation of his work on pyrenomycetous fungi.

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A series of Sunday afternoon lectures was initiated at the Garden, April 18, as already announced in the JOURNAL. They have been well received by the Garden visitors and have attracted good audiences.

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Dr. John Hendley Barnhart, Bibliographer, has returned from a vacation in Florida, following a short time spent in research at the National Herbarium, Washington, D. C., for North American Flora.

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Mr. Walter B. Balch, assistant in the instruction of convalescent soldiers, resigned his position May 31 to enter private commercial work. During the spring, in addition to his other duties, Mr. Balch had been in charge of the rose garden.

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Dr. J. K. Small, Head Curator, returned early in May from another successful collecting trip in Florida. One of the most interesting events of the expedition was the rediscovery of *Rhododendron Chapmanii* near Apalachicola, where it was originally collected by Chapman eighty years ago.

Dr. Fred J. Seaver, Curator, spent some time in Washington early in May examining collections of certain microscopic fungi preparatory to his publication of the genus *Phyllosticta* in North American Flora. This genus of parasitic fungi is represented by more than 300 species in North America.

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The most attractive display at the Garden during May was the collection of Darwin, Breeder, and Cottage tulips, presented by John Scheepers, Inc., and including almost 10,000 plants in over a hundred varieties. The collection occupied the beds of the conservatory court, and attracted thousands of visitors.

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Dr. Francis W. Pennell, Associate Curator, returned June 6 from a six-weeks trip into the southwestern states, in search of early flowering members of the family Scrophulariaceae. He collected in Georgia, Louisiana, Texas, Oklahoma, Arkansas, and Kentucky and made a number of interesting and important discoveries.

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*Meteorology for April.*—The total rainfall for the month was 4.23 inches. The maximum temperatures recorded at the Garden for each week were 64° on the 3d, 58° on the 11th, 66° on the 18th, *77° on the 22d*, and 71° on the 30th. The minimum temperatures were *24° on the 10th*, 33° on the 14th, 35° on the 25th and 38° on the 28th.

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Grading and path-making for the new iris garden in the horticultural grounds were begun in April and have been carried on steadily whenever the weather has permitted, following plans prepared by Mr. John R. Brinley, landscape architect. A considerable portion of the area intended for iris will be ready for planting in July and will be occupied by the test garden established in coöperation with the American Iris Society.

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The annual spring inspection was held May 6. The weather was perfect, in marked contrast with 1919, and the number of visitors correspondingly large. The party visited in turn Con-

servatory Range 1, the horticultural grounds, conservatory range 2, and the cherry garden, and spent the remainder of the time in the Museum building. Short talks were given during the afternoon by Dr. N. L. Britton, Dr. H. A. Gleason, and Mr. John R. Brinley.

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The North Country Garden Club, presided over this year by Mrs. Beekman Winthrop, of Westbury, Long Island, made a field-day excursion to the New York Botanical Garden on the afternoon of Wednesday, May 19. The splendid collection of tulips in the conservatory court, containing about 10,000 plants representing 117 varieties; the new iris garden under construction; the central display greenhouse recently completed; the Japanese flowering cherries; and other special features were examined by the members with much interest.

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While the outdoor plantations have suffered from an unusual winter, the greenhouse plants have prospered remarkably during the winter and spring. The occupation and enlargement of conservatory range 2 has provided the necessary space and relieved the crowded condition of last year, while a better supply of coal has kept both ranges at a more favorable temperature. The new concrete tanks in the propagating house have proved successful and have been used for starting a supply of tender water lilies, which will later be set out in the large tanks of the conservatory court.

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Specimens of two noteworthy plants have been added to the conservatories from Dr. Small's Florida collections. The one is a century plant, *Agave neglecta*, heretofore not in our collections, the other the silver-palm, *Coccothrinax argentea*. The century plant is a local species, but is much cultivated for ornament in tropical Florida. The specimens of the palm are particularly interesting. They were found over one hundred miles north of the former known center of distribution of the species in Florida, and are evidently derived directly from seeds carried of and sown by migratory birds during their northward flight.

The Nature Committee of the Good-Citizenship League Flushing, Long Island, consisting of about twenty ladies, arrived at the Garden May 17 at ten-thirty o'clock and remained all day. Beginning at the museum building, they first examined the exhibits of cork, paper, rubber, logwood, fruits, vegetables, drugs, woods, and other plant products on the main floor, after which they visited the collection of fossils, the museum of systematic botany, and the library and herbarium. At conservatory range 1, they were particularly interested in the fine display of tulips in full flower in the conservatory court. From the herbaceous grounds, they passed into the hemlock grove for a study of the principal trees, and then took luncheon at the Mansion. The afternoon was devoted to the rose garden, the vegetable garden, the propagating houses and out-door beds, the Japanese cherry orchard, the beech grove by the river, and the plantations about the lakes north of the museum building.

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Vol. 3, part 1, 1910. Nectriaceae—Fimetariaceae.

Vol. 7, part 1, 1906; part 2, 1907; part 3, 1912. Ustilaginaceae—Aecidiaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 9 (now complete), parts 1–7, 1907–1916. Polyporaceae—Agaricaceae (pars). (Parts 1–3 no longer sold separately.)

Vol. 10, part 1, 1914; parts 2 and 3, 1917. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916; part 2, 1917; part 3, 1918. Chenopodiaceae—Allioniaceae

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913; part 6, 1918. Podostemonaceae—Rosaceae.

Vol. 24, part 1, 1919; part 2, 1920. Fabaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 32, part 1, 1918. Rubiaceae (pars).

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

**Memoirs of the New York Botanical Garden.** Price to members of the Garden, $1.50 per volume. To others, $3.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. viii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 pp., with 73 figures and 14 plates. 1908.

Vol. V. Flora of the Vicinity of New York: A Contribution to Plant Geography by Norman Taylor. vi + 683 pp., with 9 plates. 1915.

Vol. VI. Papers presented at the Celebration of the Twentieth Anniversary of the New York Botanical Garden. viii + 592 pp., with 43 plates and many text figures. 1916.

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**Bronx Park, New York City**

Vol. XXI July, 1920 No. 247

# JOURNAL

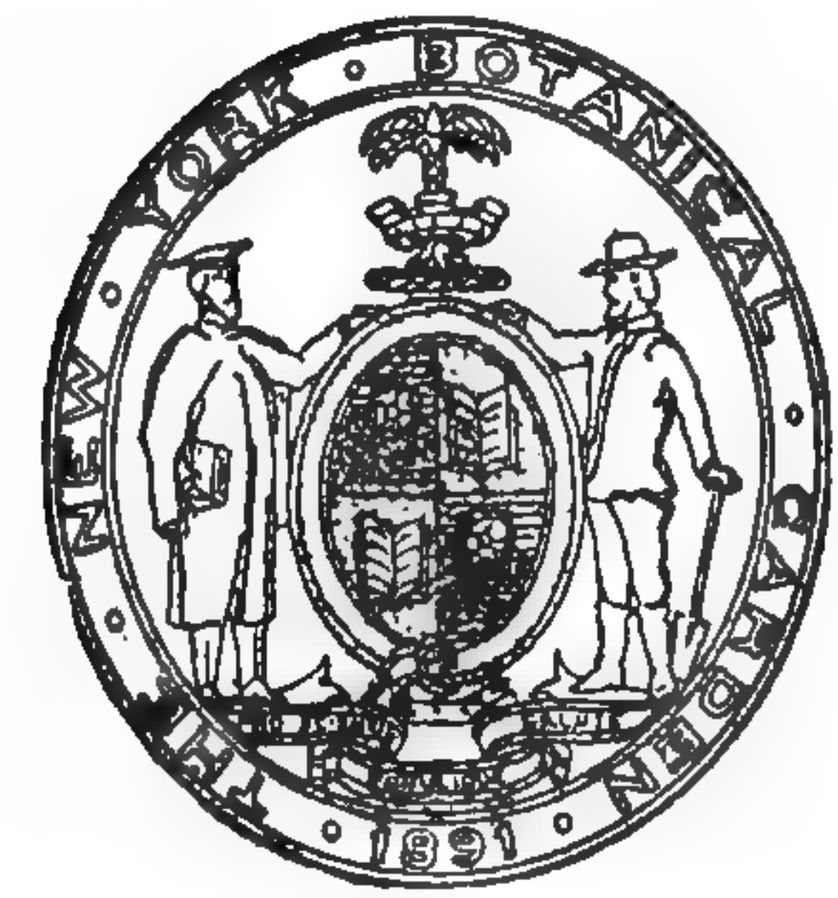
OF

# The New York Botanical Garden

EDITOR

H. A. GLEASON

*Assistant Director*

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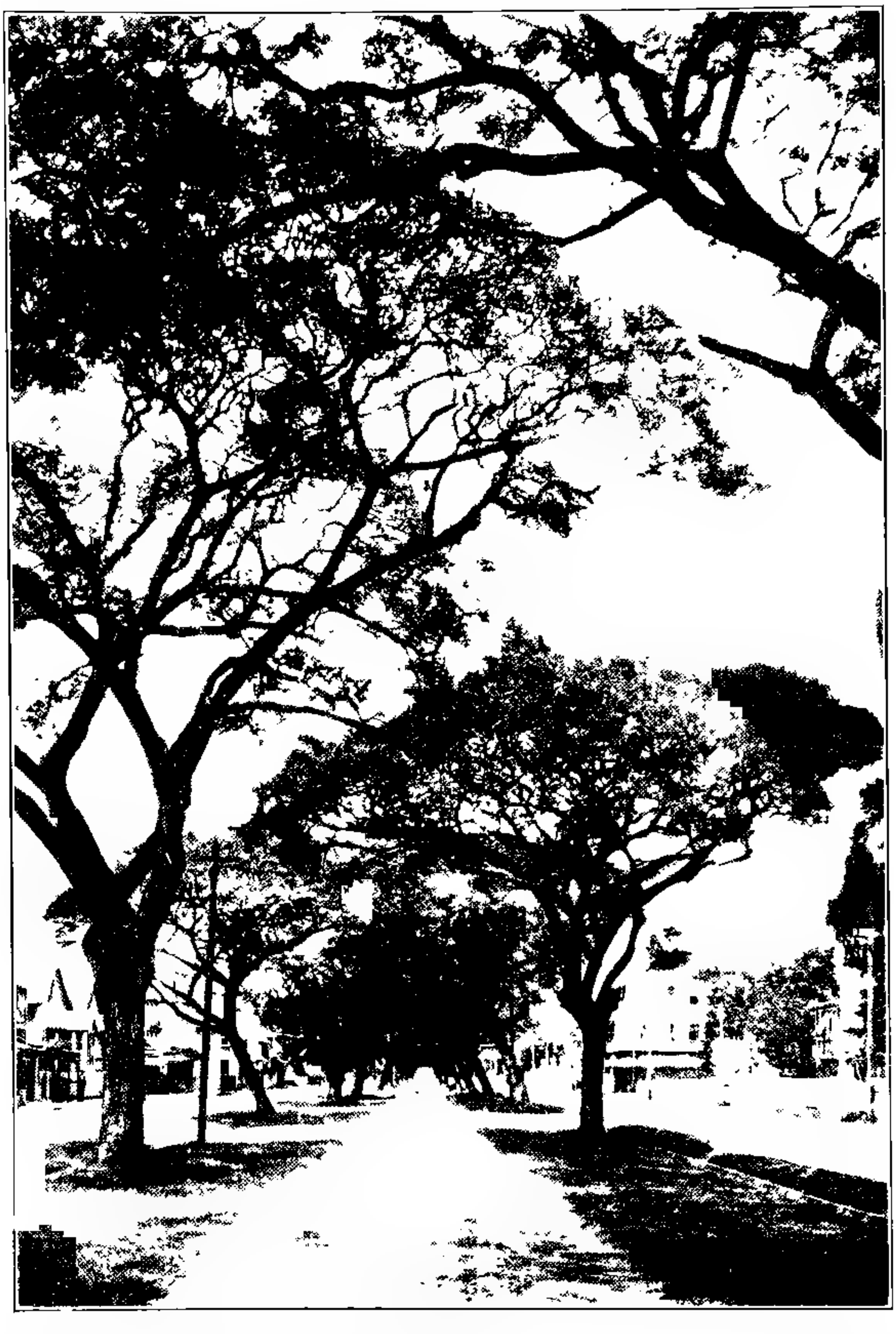

Georgetown: an avenue of Saman trees (*Samanea Saman*), a beautiful round-topped shade tree much used along the streets and common in tropical cities. often called Rain tree and Monkey-pod.

JOURNAL

OF

The New York Botanical Garden

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# REPORT ON A RECENT TRIP TO BRITISH GUIANA

(WITH PLATES 248 AND 249)

The trip to British Guiana was made through the coöperation of the New York Botanical Garden, the Gray Herbarium and the United States Department of Agriculture.

Accompanied by Mrs. Hitchcock, I left New York, October 4, 1919, on the steamer "Korona" of the Quebec Line, arriving at Georgetown October 22. On the way we went "down the Islands," that is, we made stops at several of the smaller West Indian Islands from St. Thomas to Barbados. These stops enabled me to make collections of the grasses, though the short time and the limited facilities for drying specimens did not permit the collection of other families of plants. The collections of grasses were as follows:

St. Thomas, October 11, nos. 16294 to 16320
St. Croix, October 12, nos. 16321 to 16348
St. Kitts, October 13, nos. 16349 to 16371
Antigua, October 14, nos. 16372 to 16397
Guadeloupe, October 15, nos. 16398 to 16414
Dominica, October 16, nos. 16415 to 16441
Martinique, October 17, nos. 16442 to 16469
St. Lucia, October 18, nos. 16470 to 16497
Barbados, October 19, nos. 16498 to 16525

The numbers from each island for the most part represent different species. The passage between the islands was usually

in the night, and the landing was made by small boats, except at St. Thomas and St. Lucia where the steamer comes to a wharf.

On these islands the irregular occurrence of introduced weedy grasses is of much interest. At St. Thomas, *Chloris paraguayensis* was very common, on many other islands it was infrequent, and at Georgetown was not observed at all. Why the distribution of this common tropical weed should be so erratic is not clear and it is especially puzzling why the species should be absent from Georgetown where the facilities for its introduction are ample. Many other common tropical weeds are absent from Georgetown. At St. Thomas was observed the form of *Panicum adspersum* with velvety spikelets. In our revision of *Panicum*[1] was mentioned the only specimen of this form that had come to our attention (Eggers in 1876, collected on St. Croix).

On St. Croix *Chloris radiata* was a common weed along with *C. paraguayensis* and, though not so common, *C. ciliata*. The most noticeable grass on the savannas or open dry pasture lands was *Andropogon pertusus panormitanus* (Parl.) Hack., called sour grass. The common name is somewhat confusing, as it is applied on other islands to *Valota insularis* (*Panicum leucophaeum*) and to *Paspalum conjugatum*.

Two species of *Andropogon* (*A. bicornis* and *A. glomeratus*), both called foxtail, were frequent on the grassy slopes of St. Kitts, below the wet forest of the upper parts of the mountains.

On Antigua *Chloris polydactylon* was seen in abundance in grassland, waste places, and among brush. This is the only island visited where this species was found, and since it is a perennial its presence as a weed was especially surprising.

Two interesting species were found on Guadeloupe in the low marshy land near the sea. One, *Eragrostis prolifera*, was probably growing in its type locality. As stated in another place,[2] the species was originally described by Swartz from "Insulae caribaeae," but in a later work the same author gives

[1] Contr. U. S Nat. Herb. **15**: 43. 1910.

[2] Grasses of the West Indies, Contr. U. S. Nat. Herb. **18**: 392. 1917.

as the localities, "Lucia, Guadeloupe." In the "Grasses of the West Indies" it was stated that *Eragrostis prolifera* was abundant on the sand spit at Cartagena, Colombia. Having seen both these forms growing, I think they represent distinct species. The second interesting grass was *Echinochloa pyramidalis*, originally described from Senegal. On Guadeloupe it is gregarious over a large area, growing to the height of six to eight feet.

On Dominica there is a very creditable Botanical Garden in charge of Mr. Joseph Jones. The location of the Garden is unusually fine, being in a kind of amphitheater backed by a steep mountain.

The only grasses of interest found on Martinique were *Ischaemum latifolium* and *Sporobolus muralis*. The former appeared to be introduced, though Guadeloupe and Martinique were the localities mentioned with the original description. *Sporobolus muralis* also appears to be a weed, probably introduced from Brazil.

Our steamer stopped at St. Lucia only two hours, about an hour of which I was able to spend on shore. Though the time was short I collected 27 species of grasses.

Barbados is so completely given over to cultivation that little of the original flora has survived. One finds some of the native plants along rocky slopes or bluffs that are unsuited to cultivation. Here were found the grasses *Chloris orthonoton* and *Pennisetum setosum*. An interesting case of erratic weed distribution was found here, that of *Brachiaria erucaeformis* (*Panicum erucaeforme*). In our account of the Grasses of the West Indies[1] this species was mentioned in a note but was not admitted formally to the list, as there was but a single specimen in the U. S. National Herbarium (Botanic Station Herbarium 448). I found it to be a common weed in fields on the island.

A similar case was presented by *Panicum trigonum* in Trinidad, where I stopped on the return trip. In the account of the West Indian grasses this species is mentioned without formal standing in the list because we supposed our single specimen to be a waif

[1] Contr. U. S. Nat. Herb. 18: 299. 1917.

and that the species was not established. To my surprise it was abundant in certain places in the Botanical Garden. On my previous visit to the island in 1911 I had not observed the species.

On arriving at Georgetown I at once called on Professor J. B. Harrison, the Director of Science and Agriculture. Professor Harrison took great interest in my proposed work and extended many courtesies during my visit to the Colony. Very efficient aid was also given me by Mr. Bodkin, Assistant Director of Science and Agriculture, and by Mr. Ward, Superintendent of the Botanical Garden.

For about six weeks I studied the flora in the region accessible from Georgetown. By means of a railway I was able to go as far as Parika in the west and New Amsterdam in the east. I arrived in the midst of an unusually dry season and was in consequence somewhat hampered in collecting.

The coastal area for many miles back from the sea is a level alluvial plain. The streets of Georgetown are below the level of high tide and the sea is excluded by dikes and a strong sea wall. There are many streams, canals, and marshes that harbor water plants in great profusion. Through the courtesy of the officials I was able to spend five days on the East Coast Water Conservancy. This is a diked area of many square miles that by means of canals supplies Georgetown and the plantations with water (drinking water is supplied from tanks receiving roof drainage).

On December 2 we went to the Penal Settlement, where we remained for three weeks at Colony House. The Penal Settlement is favorably located on rising ground nearly opposite Bartica at the mouth of the Mazaruni River, about 30 miles up the Essequibo River. It is near here that Professor Beebe has his laboratory. The original laboratory was at Kalacoon opposite the Penal Settlement; the present laboratory is at Kartabo, about three miles above the settlement at the mouth of the Cuyuni River, and near Kyk-over-al, an island upon which are the ruins of the first Dutch settlement. The Penal Settlement is reached by steamer three times each week from Georgetown,

FIG. 1. Entrance to the Botanical Garden, Georgetown. The collection is rich in species of palms.

FIG. 2. Dr. Hitchcock's headquarters in Georgetown. At the left and right are Flame trees (*Delonix regia*), also called Flamboyant The small tree is Frangipani (*Plumiera*).

which is at the mouth of the Demerara River. One can go all the way by steamer or go by rail to Parika on the Essequibo River and transfer to the steamer.

The next trip was to the Potaro River (December 30 to January 12). Leaving Georgetown by steamer up the Demerara River, we transferred at Wismar to a railway which took us across to Rockstone on the Essequibo above the rapids which prevent navigation up this stream. The little railroad passes for twenty miles through a peculiar region, a white sand scrub, reminding one somewhat of the scrub land of Florida. The difference between the scrub and the usual wet forest is here very striking. In the scrub the vegetation consists of scattered shrubs and low trees among which one can walk unimpeded. The herbaceous plants are comparatively infrequent and inconspicuous.

We remained two days at Rockstone, our domicile being a comfortable resthouse. A launch runs three times a week between Rockstone and Tumatumari, requiring about twelve to fifteen hours for the trip upstream. There is another resthouse at Tumatumari a few miles up the Potaro River, a tributary of the Essequibo. At this place we remained five days and found the situation and conditions very delightful. At the invitation of Mr. Percival, manager of a gold-dredging company, I visited his place further up the Potaro, going by launch to Potaro Landing and by horse-cart ten miles inland. The return journey to Georgetown was broken at Wismar and we went to Akyma and Mackenzie a short distance up the Demerara, at the invitation of Mr. Barnett, manager of the Demerara Bauxite Company. At Akyma there are extensive deposits of bauxite, an oxide of aluminum, and the company is making preparations on an elaborate scale for utilizing the mineral.

Immediately upon our return from the trip just mentioned I started for the Northwestern District, leaving Mrs. Hitchcock in Georgetown (January 13 to 22). A steamer leaves Georgetown once a week for Morawhanna on the Barima River in the extreme northwest corner of the Colony. As the trip is in the open ocean the passage is very rough. The steamer leaves Tuesday, arrives at Morawhanna Wednesday morning, departs from

there on Wednesday evening and arrives at Georgetown Thursday morning.

I spent two days with Mr. King, the Commissioner of the District, and then went to the Rubber Station at Issorora, a short distance up the Aruka River, where I staid two days at a resthouse with Mr. Dowding the Superintendent. Mr. Dowding arranged for a trip to Yarikita on the Venezuelan border which required three days. The passage was made in a large rowboat, covered amidships for the comfort of passengers. We passed up the Aruka and then up a branch stream, the Aruau, to its source. The first night was spent at an Indian benab on the upper part of the latter stream. The benab was a building with a board floor, open sides, and a thatched roof. In this space hammocks were slung and my folding cot placed. The following day we passed over a portage of about a mile to the source of the Yarikita River and down this river to its junction with the Amakura River, which forms the boundary between British Guiana and Venezuela. We arrived about noon and made our headquarters at the Yarikita Police Station where there is a small resthouse of two rooms for travelers. Of course, I had brought with me food and a bed. The best collecting was from the boat along the margin of the river where the forest overhangs the water. At one point we crossed the river and collected a few specimens from the Venezuelan side. I thus had the unique experience of collecting plants in Venezuela without ever having set foot on Venezuelan soil. We started on the return trip early in the morning and arrived at Issorora late the same evening. The following day we returned to Morawhanna and boarded the steamer for Georgetown. The remainder of my stay in Georgetown was occupied in arranging and packing my specimens and in examining the herbarium at the Botanical Garden.

The return to New York was by the steamer "Maraval" of the Trinidad Line, which stopped four days at Trinidad and a few hours at Grenada. We left Georgetown February 2 and arrived at New York February 16.

The following table indicates the collections obtained at points in British Guiana:

| Place | Date | Field Numbers |
|---|---|---|
| Georgetown | Oct. 24–Nov. 10 | 16526–16691 |
| Vreed-en-Hoop | Nov. 10 | 16692–16721 |
| Georgetown | Nov. 11 | 16722–16723 |
| Vreed-en-Hoop | Nov. 12 | 16724–16741 |
| Parika | Nov. 14 | 16742–16760 |
| Mahaica | Nov. 15 | 16761–16789 |
| Georgetown | Nov. 17 | 16790–17692 |
| Parika | Nov. 19 | 16793–16817 |
| New Amsterdam | Nov. 21 | 16818–16833 |
| Georgetown | Dec. 26 | 16834–16840 |
| Water Conservancy | Nov. 25–28 | 16860–17027 |
| Penal Settlement | Dec. 3–8 | 17028–17161 |
| Bartica | Dec. 9 | 17162–17163 |
| Penal Settlement | Dec. 9 | 17164–17172 |
| Hills Estate | Dec. 10 | 17173–17195 |
| Kartabo | Dec. 11 | 17196–17229 |
| Penal Settlement | Dec. 12 | 17230–17247 |
| Bartica | Dec. 15 | 17248–17268 |
| Kalacoon | Dec. 16 | 17269–17272 |
| Wismar | Dec. 30 | 17273–17282 |
| Rockstone | Dec. 31–Jan. 1 | 17283–17332 |
| Tumatumari | Jan. 3–5 | 17333–17383 |
| Potaro | Jan. 7–8 | 17384–17411 |
| Rockstone | Jan. 8 | 17412 |
| Akyma | Jan. 9–10 | 17413–17453 |
| Mackenzie | Jan. 11 | 17454–17465 |
| Morawhanna | Jan. 14 | 17469–17539 |
| Issorora | Jan. 16–17 | 17540–17589 |
| Portage | Jan. 19 | 17590–17601 |
| Yarikita | Jan. 19 | 17602–17659 |
| Georgetown | Jan. 25 | 17660. |

The annual rainfall at Georgetown is about 90 inches, distributed somewhat vaguely into two wet and two dry seasons.

The mean monthly rainfall at that place (an average of 33 years, 1880 to 1912) is as follows:

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8.36 | 6.78 | 7.49 | 7.25 | 11.50 | 12.06 | 10.61 | 6.31 | 3.01 | 2.35 | 5.26 | 11.46 | 91.23 |

In a moist climate like this the drying of botanical specimens is difficult. I will therefore explain somewhat at length the methods used. I took with me four slat presses, 500 sheets of standard driers, about 200 sheets of corrugated paper, and 8000 folded inner sheets. I also took a kerosene stove with wide flat wick such as is used for cooking, and purchased another in Georgetown. Kerosene oil can be obtained wherever civilization penetrates. The inner sheets were taken into the field in a collecting portfolio. The specimens were numbered and recorded in the usual way. Before leaving Washington my note books were numbered with an automatic numbering machine making three numbers to the page. This reduced to a minimum errors in numbering. The sheets of specimens in the folded inner sheets were placed in a press with single driers between and allowed to remain tightly strapped for twelve hours. The driers were then replaced by single sheets of corrugated paper and the straps drawn as tight as possible without crushing the corrugations. The press was then placed edgewise over an oil stove and a cloth draped around to act as a chimney so that heated air was forced through the press. Many plants will dry in 12 hours, most of them in 24 hours and the succulents in two to four days. The corrugations should run crosswise of the sheets and the press should be only about 12 to 15 inches thick. A second press can be suspended above the first to utilize waste heat. By running two stoves night and day I could handle all the plants I could collect. The object of placing the plants first in a tightly strapped press with driers was to flatten them out, otherwise they would crinkle in the corrugated boards. The wet driers are dried in the sun when possible but they can be used even when wet. When the dry specimens are taken from the press a small quantity of naphthalene is sprinkled in each sheet to prevent molding. The single-faced corrugated paper was preferred to the double faced and the sort with driers permanently attached as facing was found useless. The clothes racks much used in the Colony and built on the plan of an enlarged towel rack were found satisfactory for supporting the presses over the stoves.

At the Botanical Garden there is an excellent herbarium based upon Jenman's collection and called the Jenman Herbarium. Professor Harrison has indicated a willingness to place this herbarium at the disposal of taxonomic botanists and will probably lend to responsible investigators for study such genera or families as may be needed.

I had with me as a helper during my entire stay a young colored man, Edward Stewart, who accompanied me in the field, did my cooking when away from my base, and aided me in various ways.

It is to be regretted that I was unable to reach the more remote parts of the Colony, such as Roraima and the southern savanna region or Rupununi District, but the difficulty of travel prevented this. One must travel entirely by boat and the rivers are all much impeded by rapids and waterfalls. It would require special transportation arrangements and a minimum of about three weeks to reach the Rupununi District from Georgetown. It therefore seemed advisable to use my limited time in visiting the points accessible by regular transportation.

British Guiana has an area of about 90,000 square miles, is about 400 miles deep, and extends about 250 miles along the coast (lat. 1°–8°, N.; long. 57°–61°, W.). There are three counties: Demerara, including the drainage system of the Demerara River and to the Abary river on the east; Essequibo, including the drainage system of the Essequibo River and all to the west; and Berbice, including the drainage system of the Berbice River and east to the Courantyne River. Georgetown, at the mouth of the Demerara River, has a population of about 60,000. The only other city is New Amsterdam, at the mouth of the Berbice River, with a population of about 9000. The entire population of the Colony is about 300,000, about 4000 of whom are whites. The bulk of the population consists of East Indians (42.7 per cent.) and negroes (39. per cent). The chief product of the Colony is sugar, which, together with the by-products rum and molasses, constitutes about three fourths the exports. Other products are gold, rice, balata, timber, and cattle. The country is fairly healthy, the death rate being about 35 per 1,000 (14.8 per 1,000 among whites). Yellow fever is absent, but malaria and dysentery are prevalent.

A. S. HITCHCOCK

## THE 1920 DAHLIA BORDER

The 1920 dahlia border, planted during the second week of June, gives promise of excelling the dahlia exhibits of the past two seasons in beauty and general interest. The planting, subject to slight changes owing to failures and replacements, includes nearly 500 varieties, represented by 732 individuals as compared with 343 varieties, represented by 607 individuals, of the last year's collection. The main border occupies the same position as during the past two seasons, with, however, an overflow annex of about 130 plants, including the singles, the collarettes, the pompons, the shows, and a few of other types, in the border at the south of the railway station plaza. There are twenty-seven contributors of roots and plants this season, as will be announced in more detail under head of Accessions, including most of the leading commercial growers and originators of dahlias in the United States. Among the new exhibitors are J. K. Alexander, East Bridgewater, Mass.; F. C. Burns, San Rafael, California; Frank D. Pelicano & Co. and R. McWhirter, San Francisco; Richard Vicent, Jr. & Sons, White Marsh, Md.; Mills & Co., Mamaroneck, N. Y.; N. Harold Cottam & Son, Wappingers Falls, N. Y.; and Mrs. Charles H. Stout, Short Hills, N. J. Among the old friends of the border, notable new contributions have been received from W. J. Matheson, Huntington, N. Y.; The Dahliadel Nurseries, Vineland, N. J.; J. J. Broomall, Eagle Rock, California; Emily Slocombe, New Haven, Conn.; Geo. L. Stillman, Westerly, R. I.; Alfred E. Doty, New Haven, Conn.; and C. Louis Alling, West Haven, Conn. Broomall, Slocombe, Alexander, Burns, the Dahliadel Nurseries, and others have sent their best novelties for 1920, and these are likely to prove a most valuable and interesting feature of this year's display, which promises to make a close approach to exhibiting the cream of the world's dahlias.

MARSHALL A. HOWE

# NOTES, NEWS AND COMMENT

The following visiting botanists registered in the library during late April and May: Professors H. H. Whetzel, L. H. Bailey, and H. M. Fitzpatrick, Ithaca, N. Y., Mr. G. N. Hoffer, Lafayette, Ind., Professors Edith M. Twiss and Edith A. Roberts, Vassar College, Mr. W. B. Tisdale, Madison, Wis., Mr. Harry Lebau, Rutherford, N. J., Dr. Perley Spaulding and Messrs. Frederick V. Rand and W. W. Eggleston, Washington, D. C., and Mr. L. H. Knoche, San Jose, California.

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Miss Elizabeth B. Higgins, Librarian at the Bernice Pauahi Bishop Museum, Honololu, Hawaii, visited the library on May 4.

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Dr. P. A. Rydberg spent several days during May at the Gray Herbarium of Harvard University in the preparation of manuscript for North American Flora.

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Dr. F. W. Pennell returned to the Garden June 7, after a six weeks' collecting trip for plants of the Figwort and other families in the West Gulf States. An account of his trip will appear in a later number.

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Miss Hester M. Rusk has been appointed Technical Assistant at the Garden, beginning July 1.

---

Mr. E. E. Watson, since January 1 assistant in gardening instruction, has been appointed instructor in botany at Rutgers College, and discontinued his work at the Garden July 15.

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Dr. A. B. Stout visited the New York Experiment Station at Geneva during the middle of June, in continuation of his studies on sterility and fertility in grapes.

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Dr. Fred J. Seaver spent several days at Pennsylvania State College on a mycological collecting trip in collaboration with Cornell University, Syracuse University, and Pennsylvania State College. A more complete report of this trip will be made at a later date.

The Wild Flower Preservation Society and the Torrey Botanical Club held a joint meeting at the Mansion June 2. The chief feature of the program was an address by Dr. Homer D. House, State Botanist, on "The Wild Flowers of New York." His remarks were illustrated by colored lantern slides and by plates from his new publication on the same subject.

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The annual meeting of the Woman's National Farm and Garden Association was held in the Mansion of the New York Botanical Garden on May 25, Mrs. Francis King presiding. After the luncheon, at which Mrs. Charles D. Norton was hostess, a walk was taken through the hemlock grove and herbaceous valley to the tulip beds in the conservatory court. The weather was fine and the flowers in superb condition. A lecture by Professor L. H. Bailey, the distinguished horticulturist and agriculturist, on "Coöperation in Agriculture" concluded the program for the day. This association has increased rapidly in numerical strength and is becoming an important influence in bringing the producer and consumer together.

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Dr. Frank S. Collins of North Eastham, Mass., one of the best-known writers on the American algae, died suddenly on May 25, in the 73d year of his age. Dr. Collins was a frequent visitor at the Garden, his last visit having been made only a few weeks before his death. His two most important works were "The Green Algae of North America," with its two supplements, and "The Algae of Bermuda," the latter in coöperation with Dr. A. B. Hervey. In association with Prof. W. A. Setchell and the late Isaac Holden, he issued the Phycotheca Boreali-Americana, a collection of dried specimens, which in point of number of specimens distributed has had only one rival among the algae exsiccatae of the world. Dr. Collins contributed the account of the blue-green algae to Britton & Millspaugh's "Bahama Flora," now in press.

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Construction work at the Garden during May and June included work on excavating, grading, and path-making in the new Iris Garden and the adjacent grounds, further work on the

Cherry Garden Shelter House, repairs to the brick pillars and retaining wall in front of the Museum, painting the boundary fence on Bronx Park East, and painting and repairs in Conservatory Range 1.

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About 150 biology pupils from Washington Irving High School, accompanied by their teachers, spent the forenoon of June 15 at the Garden. They were first divided into groups and taken through the greenhouses, flower gardens and tree plantations by members of the staff; after which they heard a lecture on "Trees" and examined the museum collections.

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About 400 biology pupils from Morris High School attended a lecture on "Trees" at the Garden at one o'clock on June 16, after which they studied various representative specimens on the grounds under the guidance of their own teachers and members of the Garden staff.

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On June 17, biology pupils from Evander Childs High School visited the Garden for their regular greenhouse and museum exercises. The stormy weather reduced the attendance to about 115 and made it impossible to examine the herbaceous garden, but everything else went through according to the schedule prepared by Mr. Mann. An excellent lecture on "Forestry," given by Mr. George T. Hastings, was listened to with deep interest.

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*Meteorology for May.*—The total precipitation for the month was 3.13 inches. The maximum temperatures recorded for each week were 72° on the 9th, 80° on the 10th, 81° on the 22d, and *83° on the 29th.* The minimum temperatures were *36° on the 5th* and *on the 15th*, 44½° on the 18th, and 48° on the 31st.

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The rose garden, located just to the south of the Mansion on the eastern side of the Garden, bloomed freely during June. The flowers continued at their maximum quantity during June and early July; through the remainder of that month and in August there are but a scattering display; from September on to the time

of killing frosts the amount of bloom will again increase. The past winter was extremely severe on roses, hybrid teas suffering particularly. Even hybrid perpetual roses were killed almost to the ground, something which has not happened before in the history of the institution. The killing of the stems almost to the ground necessitated very severe pruning, the result being fewer but larger blooms. As has been the usual custom here, hybrid perpetual roses were not protected, but all others were mounded, that is, earth was piled around the stems to a height of eight or ten inches, this serving in previous years to protect them amply from the winter's cold; in some instances this protection was entirely inadequate the past winter.

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Despite the backwardness of the season, the vegetable gardens of the students in gardening are now (June 30) doing extremely well. Several crops of lettuce, radishes, and spinach have been harvested, kohlrabi is coming on, tomatoes are setting fruit, and clean crisp Swiss chard is ready to cut. Lettuce has been very plentiful; the students have it in all corners, between cabbage and tomatoes, and between rows of other crops. Beans and peas are strong in foliage, and give promise of bearing many full pods. Especially noticeable is the robust growth and clean foliage of the cabbage and tomatoes. Some of the celery has been planted in double rows, water being furnished in surface irrigation between the rows. No serious pests or diseases have appeared, but the ground moles have tunneled passages under many fine plants.

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A flower show was held June 12th and 13th in the Museum building, in coöperation with the Horticultural Society of New York. The schedule of prizes was mainly for roses and peonies, but owing to the unusual lateness of the season, few roses and peonies were exhibited. The show was held a week later than that of last June, and yet fewer flowers were available. The Garden made a large exhibit of irises and of the flowers of trees and shrubs.

# ACCESSIONS

## MUSEUMS AND HERBARIUM

40 colored lantern slides of wild flowers. (Prepared by Mr. L. W. Brownell.)

24 specimens of flowering plants from Missouri. (Collected by Mr. B. F. Bush.)

2 specimens of hepaticae from California. (Given by Mr. George M. Pendleton.)

123 specimens "Kryptogamae exsiccatae" Century XXI. (For the Columbia University Herbarium.)

1 specimen of *Daedalea confragosa* from Long Island, New York. (By exchange with Prof. A. H. Graves.)

1 specimen of *Fomitiporia laminata* from New York. (By exchange with Dr. H. D. House.)

1 specimen of *Fuscoporia viticola* from South Carolina. (By exchange with Dr. W. C. Coker.)

1 specimen of *Crepidopus ostreatus* from California. (By exchange with Dr. A. S. Rhoads.)

1 specimen of *Podaxon* from Cuba. (By exchange with Brother Hioram.)

55 specimens of ascomycetous fungi mostly from New York. (By exchange with Dr. H. D. House.)

1 specimen of *Gymnopilus Nashii* from Cuba. (By exchange with Brother Hioram.)

75 specimens of rusts and smuts from the local flora range. (Collected by Mr. Percy Wilson.)

1 specimen of *Lentinus crinitus* from Florida. (By exchange with Dr. M. S. Whetstone.)

1 specimen of *Calostoma cinnabarinum* from Pennsylvania. (By exchange with Prof. J. F. Adams.)

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Vol. XXI August, 1920 No. 248

# JOURNAL

OF

# The New York Botanical Garden

EDITOR

H. A. GLEASON

*Assistant Director*

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THE PARAFFIN METHOD OF GRAFTING

JOURNAL

OF

The New York Botanical Garden

VOL. XXI August, 1920 No. 248

## FURTHER REFLECTIONS OF AN ORCHID-HUNTER

How we should welcome a "Flora of Manhattan," of the year 1609! We can picture to ourselves the appearance of the island, when Hendrick Hudson and his companions first looked on it; but we very much want something more substantial than fancies or impresssions. We want records and herbaria. It is not till some generations later that we begin to get them in America. In the days of Hudson and his adventurous rivals, exploring expeditions were not equipped for scientific pioneering. We are quite sure that there was no botanist on the "Half-Moon" when she came slowly up the bay. Our curiosity is piqued, but not satisfied by the pleasant statement of Washington Irving,[1] when he tells us that some of the abundant trees were "loaded with a verdant burthen of clambering vines, bowing their branches to the earth, that was covered with flowers." He specifies "the dogwood, the sumach and the wild brier, whose scarlet berries and white blossoms glowed brightly among the deep greens of the surrounding foliage." All of these beauties linger still within a few miles of the place where Hudson landed. The day was the third of September; so we can credit the dogwood berries and perhaps some late flowers of a *Rubus*; but we should like to know what were those other vines that, with tropical intensity, bowed the lofty trees; and we desire even more strongly to know

1 Knickerbocker's New York, p. 90. Putnam ed. 1863.

the names of the scores of other plants that crowded the wooded hills of Manhattan on that distant day.

We shall never know; records are lacking; wishes and guesses do not take their place. The scientific imagination looks forward not backward; it develops theories and plans, not legends. These reflections are prompted by the conviction that our regrettable lack of definite knowledge of the plant life of Manhattan three hundred years ago should be a warning against present neglect. Throughout an area many times as great as the twenty-two square miles of Manhattan Island, species are disappearing or are waiting to be discovered. Unless botanists of the present generation are unremittingly active during the next few years, they will fail to secure some evidences of plant life and distribution which would be invaluable to their successors. In spite of all that has been done, much remains unattempted. No one can predict how important some facts, as yet undiscovered, may be. In spite of the admirable and intelligent, and profitable specializing in fields of botanical science that till recently had not been entered, it remains true that the base of all our investigations is the plants themselves; questions of ecology, association, soils, distribution, economic values, though immeasurably important, are secondary; the facts, of the presence and prevalence of species, come first. The structure of all botanical knowledge, whose apex reaches high, rests on quadrats!

These reflections are concerned with the orchid-flora and constitute a plea for prompt advance in thorough acquaintance with that, especially in the Eastern States. Similar considerations apply to all plant families, but not to all with quite the same urgency. For our native orchids are usually harder to find than most species of flowering plants and are also more exposed to spoliation, at the hands of over-enthusiastic collectors, or, in the vicinity of many cities, by the vandalism of children and excursionists. Hence the need for prompt and diligent search before some species are exterminated, and in order that others may be discovered, or at least detected in new places; so as to provide the material for thorough study, comparison, inference and record.

This plea for prompt and vigorous activity in extended investigation of our native orchids may be urged on three grounds.

1. First, the fact that the orchid flora is not yet fully known. We have been beguiled into unwarranted complacency by the present extent of our knowledge, which is both interesting and stimulating. We do know a good deal and some of this information has been very thoroughly exploited. Some traditional localities for certain rarer species have been visited too often by collectors more enthusiastic than prudent. Some commoner species have been reported from so many places in different States that we have failed to think whether we could draw from herbaria any sound conclusions as to the actual distribution, county by county, of the sporadically collected plants.

Some recent results of intensive exploration emphasize by comparison both what may be done and what has not been done. In the vicinity of Squam Lake in central New Hampshire thirty-three species of orchids have been found during a period of about ten years, chiefly by a few of the members of a boys' camp, in a tract of one hundred square miles. During the same period the writer has found the same number of species and with few exceptions, the same species, in the town of Fairlee, Orange County, Vermont, in nearly the same latitude as Squam Lake and about thirty-five miles distant, in an area of less than eight square miles. A few weeks of occasional exploration last summer in Ulster County, New York, chiefly in an unpromising region, resulted in the collecting of fourteen species. Nor are the numerical results the only interesting facts in these explorations. Though the work was done by amateurs, in the Squam Lake region large colonies of *Triphora trianthophora* were found,[1] including in some years thousands of blossoming plants, and valuable data were obtained in regard to the growth and the periodicity of this little-known species. In Ulster county new stations were found for *Triphora, Corallorhiza odontorhiza* and *Peramium ophioides*. In Fairlee *Cypripedium arietinum* was found in great abundance on a dry, rocky hillside; *Cypripedium*

[1] *Rhodora* **22**: 53. 1920.

*hirsutum*, Mill., *Malaxis monophylla* and *Lysiella,* well established in certain cold bogs, and *Pogonia ophioglossoides* locally very abundant. Many of the more interesting species were not found in the first or the second year of investigation; almost every year was crowned with fresh discoveries. It was not till the eighth summer in Fairlee that *Ophrys cordata* was found. *O. convallarioides* had not been observed until the year before, though both of these species had been anticipated and searched for.

Moreover, the numbers found in Fairlee and about Squam Lake have a relative significance, in addition to their own value and the identity of the species involved. Thirty-three is just about half the number of species listed in Gray or in Britton and Brown. It is greater than the number reported from West Virginia and only two less than those enumerated in Miss Blair's carefully compiled Orchids of Ohio. Only thirty-nine species are reported from Alabama and forty from Tennessee. Such numerical comparisons have no exact scientific value. They take no account of the inevitable differences of growth in different regions or of the probable effect of unknown factors. They do, however, say plainly that intensive exploration yields unexpected and valuable results. They do provide incentive for such definite, painstaking study.

The need of this specialized and prolonged study is emphasized, for our native orchids, by reflecting on some reasons why our orchid flora is, apparently, less fully known than, for example, such genera as *Viola* or *Carex* or families like the Mints, the Roses or the Arums. Four reasons may be mentioned, all stimulating to the zealous collector and student; the brief anthesis of many species, the inconspicuousness of many, a prevalent sporadicity of occurrence and the secluded, not to say almost inaccessible, spots in which many species prefer to live.

The ordinary record in the Manuals, as: June, July; May–July, sufficiently accurate for its purpose, obscures the fact that in any one locality the flowering season is much shorter than is indicated by these terms. Of our nearly seventy species in the eastern and middle States, scarcely twelve continue to bloom, in

any one locality, during thirty days, and not more than five or six, chiefly Habenarias, in the inclusive sense, for more than one month. For the great majority, the anthesis is brief, often not more than a few days, though it is modified by the presence or absence of the needed insect visitors. Notably in *Cypripedium arietinum* and *Isotria verticillata* the flowers develop and wither within about seven days. *Malaxis unifolia* develops slowly and continuously during the whole summer, but *M. monophylla* has the opposite habit; one might pass by its home unsuspectingly in early July and a week later find the tender scape well-grown and the minute flowers open. This species is probably not so rare as it is reported to be; it hides. Of course many species can be detected quite as readily in fruit as in flower, some, as *Liparis Loeselii,* more readily; but very many plants do not reach the fruiting stage in a given year, and, in the majority of our eastern species, the plant is likely to be less readily discerned after the flowers wither, because of the decay and disappearance of its leaf or the luxuriance of surrounding vegetation or the blending of the tones of color as the summer draws toward its close. Particularly of *Aplectrum* is it true that the infrequent visitor to some regions where it grows might walk over its hiding-place during ten months of the year and not suspect its presence. In some more southern localities its wrinkled green leaves, where it is abundant, are conspicuous through the winter; but throughout most of our region neither the brownish-red leaf-tips in September nor the graying leaves in May are likely to attract any but an experienced hunter. And if there is no fertilization the brown scape withers promptly. Then during three months or more, neither leaf nor scape gives notice of the sleeping corm.

Allusion has been made to the minute blossoms of *Malaxis*. The whole plant too, is small, as is the case also with all of our species of *Ophrys*. There are other causes of inconspicuousness in very many of our orchids. Some grow in dark places, many in the midst of a rank surrounding herbage. Some imitate or at least adopt the prevailing shade of green that is fashionable in their neighborhood. It is difficult often to detect *Liparis*

*Loeselii* or *Blephariglottis lacera* or *Perularia* or *Malaxis unifolia,* even when one knows they are almost within reach. With several species only the blossom betrays their presence to other than a keen and practiced eye. Some of the taller species grow frequently among grasses and sedges. There are only a few species whose habit is to thrive conspicuously in open places or to form large colonies that attract attention by their size.

It is true that some of our native orchids are noticeable at a distance, because of the size or the beauty of their flowers or because of something unusual in their aspect. No one can pass within range of the bog that harbors the big *Cypripedium* without seeing its splendid flowers, and the coral roots stand out distinctly from the surrounding greens. *Arethusa,* though of short stature, is conspicuously beautiful in bogs, in the spring; if it bloomed in midsummer it would be difficult to detect. The same is true of *Calypso* and even of *Orchis;* though there is a peculiar texture in the leaves and a uniqueness in the whole aspect of any orchid that catches the eye of an enthusiast.

One reason why even the more conspicuous species are not reported more frequently is that they grow in remote or secluded places, difficult to approach or to explore. When these stations are known, they are eagerly visited, but to discover such sanctuaries of beauty requires enthusiasm and knowledge and persistence beyond the usual amateur equipment. There is little doubt that some species accounted rare or local might be found in many places if they were sought for diligently. Some recent discoveries in New York State emphasize this reasonable expectation and indicate clearly the need of exploring even unpromising localities.

Moreover a single visit or a few visits at long intervals will not surely exhaust the possibilities of a region or even of a comparatively small tract. There is with many species—perhaps with all, though it hasn't yet been proved against them—an uncertain periodicity, which baffles the explorer and compels frequent and intensive scrutiny. In Johnson County, Iowa, *Corallorhiza odontorhiza* was common in a certain deep wood in the

year 1896; before and since it has been rare in the same place. This instance is exemplary, not unique. It could be paralleled by many observers if they had made records. Sometimes the periodicity is only in regard to blossoming, as in *Peramium pubescens,* of which the writer knows one colony, containing more than two hundred plants, in which seldom as many as ten are found in bloom in any year, though all seem to be thriving. Some of the tenderer species are affected doubtless by transient climate differences. A severe winter or a late frost may prevent flowering even when it doesn't kill. Some maturity of years is apparently necessary before the first blossoming. The vigor or readiness to bloom which would normally be attained in three or four years may be delayed by unfavorable conditions. We can guess, more or less reasonably, various explanations of the sporadicity of occurrence of many species; but the fact is plainly evident and is another reason why all orchids are not yet fully known. All of these causes, the brief anthesis of some, the inconspicuousness of many in flower or leaf, habitats not easily discovered or approached, a baffling periodicity, combine to present a challenge to orchid-hunters. Those who wish to become really acquainted must take pains and use their eyes and persevere.

2. A second ground for the plea here urged is the rather surprising fact that few if any of our great herbaria are well supplied with abundant specimens for record and future study. Care and diligence are now shown in designating type specimens and in identifying those of an earlier generation. Diagrams of localities, maps indicating distribution, photographs, often including habitat conditions, are multiplying. Card-catalogues in some institutions are prepared to serve both the present and the future. But specimens are too few. Card catalogues emphasize this lack, betray this paucity. Some eager student, fifty years from now, could get, from most of our present collections, no more satisfying answers to his questions about distribution, with its frequent implications of specific differences, than we have now to our queries about the prehistoric Flora of Manhattan!

We have a good deal of material but not enough; a scientific induction needs *all* available facts. Records without justifying specimens are baffling. Specimens from a restricted area or a less than adequate territory may not puzzle but are likely to mislead. Sometimes they are disappointing, as when recently an inquirer came from an adjacent State to one of our larger herbaria to get information about the anthesis of *Blephariglottis fimbriata* and *B. psycodes;* and learned that his private collection furnished a fuller answer than he could get from the very meager possessions of the visited herbarium.

Ten years ago Mr. Oakes Ames published his monograph of *Habenaria.* The stations listed are derived from study of this genus in twenty-two herbaria, including those at Cambridge and Washington, that of the Missouri Botanical Garden and that of the Geological Survey of Canada. In five of these collections, all of the twenty species recognized in Gray's Manual are represented, and all but one or two in four more. It is not surprising that in the rest, about four sevenths of the whole number, chiefly private or local collections, comparatively few species are preserved. It is noteworthy, however, that even in the National Herbarium and the Gray Herbarium, with few exceptions, no more than twenty-five localities and fewer states are represented in the specimens of widely distributed species. The herbarium in Ottawa is better furnished, in the representation of some northern species of this genus, than any in the United States. Additions have been made, of course, to the great collections, during the ten years since, but at the time of the publication of Mr. Ames's monograph, a species so widely distributed and readily discerned as *H. bracteata* (Willd.) R. Br. is represented in the National Herbarium by specimens from thirteen states only, and in the Gray Herbarium from nine; Maine does not appear at Washington, nor Pennsylvania at Cambridge, nor Wisconsin in either collection; assuming that the enumeration in the monograph was complete when it was made. In the writer's own collection, gathered chiefly during the last five years, *Liparis Loeselii* is more widely represented than in one

herbarium that contains more than 100,000 species. The explanation of such regrettable *lacunae* is, of course, easy to find. Not much careful study has been given to the distribution of the Orchidaceae and exploring expeditions covering large areas have usually been conducted rapidly, with only brief pauses and with scant opportunity for scrutinizing search. Where the reverse has been true, as in some Canadian surveys, a much greater number of stations is represented, in a few herbaria. Speaking generally, but in the language of facts, no one herbarium now tells the whole story of distribution, even as it is now known, for any species of *Habenaria*. Not at the Smithsonian nor at Cambridge nor at the New York Botanical Garden can one study the distribution of our native orchids with all available, not to say all desirable, material. There is enough in several places to encourage the desire for more; but in no one herbarium nor in all together is there adequate representation of the orchid flora of all the states of this country and Canada. All who love our native orchids must wake up to this condition and take pains to improve it before it is too late.

3. For, thirdly, our orchids are disappearing, at least in the Atlantic States. Some have always been labeled "rare" because we haven't hunted for them, but nearly all are rapidly becoming scarce. Never flourishing in our territory with tropical exuberance and sensitive, apparently, to slight changes of environment and association, they are disappearing before many enemies. "Civilization" of course is deadly to them. We are not surprised that the swarming population has driven them from Manhattan Island, where, even fifty years ago, at least seven species were growing though not flourishing. We are, however, surprised and disappointed that in the neighboring Borough of Richmond not more than one or two survive of the twenty and more species that have been found within thirty years. It both enhances and embitters our regret to know that vandalism, rather than the natural processes of reclaiming land for human use, is the chief cause of the disappearance on Staten Island of *Triphora* and *Tipularia* and the fringed Habenarias. In places remote from

great cities the process of extermination goes on; trees are felled, swamps are drained, thickets are cut down; golf succeeds grazing; the nooks and dells and shady ravines and springy hillsides disappear. Nature, too, takes a hand in the changes. The salt tides come inland beyond their wont, as in Southern New Jersey; a killing frost penetrates deep or lingers long in many a northern bog; the tender roots of some cherished species are poisoned or shriveled; the station is lost, the colony vanishes. In undiscovered ways, too, natural causes, without waiting to be charted or directed, join with human agencies in hastening the disappearance of our orchids. When we know more about mycorhiza and the chemistry of soils we may be able to follow these processes mose closely; but that enhanced knowledge will hardly reconcile us to the patent fact that species once prevalent become rare and disappear in some localities, without rash collecting or rude despoiling. The writer could go almost to the spot where he collected *Arethusa* in a thriving colony, near Rutland, Vermont, some thirty years ago, but it cannot be found there now, any more than in Fairlee, from which it is reported more recently. When we come upon one lonesome, rather depauperate, plant, and find none of its kindred within many rods or in the same town, we know that we are witnesses of the vanishing of a species. Then when we read, of some rare Habenaria, "hundreds of acres of it," "very common in moist fields," "our most common species, sometimes four feet high," we wonder whether other species for which we search now often in vain were once so abundant and luxuriant. For the home of that "most common" species is now a cultivated farm; if you go there you find grass and corn instead of *H. peramoena*. Mr. William Beebe has epitomized many such occurrences: "To every succeeding generation the country near at hand becomes less like wild planet land and more like a museum . . . and only those who love nature enough to make sacrifices of time and effort win through to the few wild places left in far distant corners of the earth." He was thinking of birds chiefly and of the protection (!) afforded by trespass-signs, but his words are fatally true of

most of our native orchids, which shrink before the breath of change and perish in the face of civilization.

Surely there are grounds for our plea. We do not know our orchid flora thoroughly well; what we do know is not adequately represented even in the great herbaria; species are diminishing and disappearing fast. Yet there are rewards for searching; the known stations for *Ophrys australis* in New York State have been mutiplying within the last few years; in Cape May County, New Jersey, *Habenaria nivea,* has been found recently and *H. integra* has been rediscovered. Always, fortune beckons and leads to unexpected finds. Pleasure as well as obligation is implicit in the plea for prompt and persistent prosecution of orchid study.

The obligation however seems imperative and clear. Though species disappear, the memory of them must persist and records must support and authenticate it. Not only in our newer dependencies, or in Florida or Texas, where luxuriance invites and frequent discoveries stimulate the explorer, but in the older states, the search for both species and stations should be prosecuted with untiring perseverance. In some states the orchid flora is probably very limited but we want to *know* its extent. In the oldest states scores of counties are unexplored; we want to know their testimony, even though it prove to be only corroborative. We want for the whole country such analyzed information about the periods of growth as is given in Taylor's Flora of the Vicinity of New York. We want certified observations in regard to the insect-helpers of every species. We want, for each genus, at least, such careful study of underground growth as Mr. Lownes has made of *Triphora.* We need "nation-wide" comparison of the dates and duration of anthesis, of identical and related species; for temperature and latitude seem not to tell the whole of this story. Revision is needed of some statements in our Manuals in regard to measurements, time of flowering, rarity, distribution. Most of these requirements imply the work of special enthusiasts, local observers, patiently doing intensive study. Institutions and curators of herbaria can help by

encouraging such personal investigations, as well as by prosecuting generous plans for exploration and exchanging. Local herborizing can best be done by resident amateurs, for no locality tells all its secrets to the tourist; each month shows a different orchid flora and every year has probable surprises in store. Both local and general exploration are stimulated by accurate record and study of what has already been attained. Catalogues of state and local floras, maps and other pictorial helps stimulate effort. Apparent discrepancies clamor for the fuller knowledge that will reconcile them. Lack of information rouses both curiosity and energy. In proportion as we learn more we wish to know the rest. Need stirs us to effort, effort rewards and feeds desire. The gracious circle completes itself again and again.

These reflections will seem to some to look forward to a vague and very distant future. As a matter of fact that future must be near or it will never be reached. We must prosecute our inquiries, collect our facts soon if at all. "Now or never" is literally true of orchid exploration in many places; and "Now" means not more than a few years. As the kind of development in Manhattan is steadily pushing not only the early families but all householders off the island, so advancing civilization is steadily obliterating our native plants. We must hand on descriptions, records, photographs, specimens of the orchids. We must gather our material promptly. We must be busier than the destructive forces. We must do all we can every year.

"The search for lost opportunity is endless" and unrewarded; the search for some undiscovered orchid, though never finished, is a perennial joy.

HERBERT M. DENSLOW.

# GRAFTING WITH THE AID OF PARAFFIN[1]

(WITH PLATE 250)

The grafting of nut trees has been particularly difficult as a rule for two or three reasons, apparently. Repair of wounds by callus takes place more slowly with some members of the nut-tree group than it does with many drupes or in the rose family. The Juglandaceae, in particular, carry a good deal of sugar in their sap and it is apparently a pabulum for various microbic parasites which exert a destructive influence upon new cell formation. There is a tendency toward drying out of the graft before repair takes place in many of the hard-wood trees and in the hard-wood group nice adjustment between the cut surface of the scion and that of the stock is difficult because of the rigidity of the wood.

Various obstacles are overcome by the method of applying melted paraffin not only to the wound in the stock but also to the entire scion, buds and all. This prevents escape of moisture from the scion and maintains a sap tension corresponding to that of the stock in the presence of negative and positive sap pressures. Furthermore the melted paraffin fills all of the interstices which would otherwise be occupied by decomposing sap.

The form of graft must be adapted to conditions of the stock. For example a branch of stock of approximately the same diameter as that of the scion may be split in the common cleft-graft way. On the other hand if the branch to receive the scion is somewhat larger in diameter than the latter the cleft is made at a point which will allow the cambium layers of the stock and scion to be brought neatly together. Better than the cleft graft is the "bark-slot" method. A slot of the width of the scion is made in the bark of a branch or trunk of almost any size and the scion is inserted into this slot in the bark. Wrap-

[1]Abstract of a lecture delivered at the Garden on May 29, 1920. The accompanying photographs were taken at the time by Mr. R. Reid.

pings of raffia will suffice for small cleft grafts but for the bark slot the Spanish windlass is preferable. This consists of a strong cord tied loosely about the stock where the graft is inserted and this loose cord is then wound up with a skewer acting as a twister. When the cord has been wound tightly enough the long arm of the twister is fixed in the bark of the stock with a two-point tack to prevent unwinding.

This form of fixation of the scion has several advantages. It holds the scion very snugly against the stock. It allows perfect covering of all wound surfaces with melted paraffin and also increased growth of the stock during the summer without need for readjustment of the fixation device. The adjustment is automatic. As the stock increases in diameter during the season's growth it unwinds the Spanish windlass on the stock side with a corresponding winding up of the cord toward the twister side.

When preparing stocks for grafting purposes it is well to cut them back during the dormant season and paint the cut surfaces or cover them with melted paraffin. While this is the preferable way for preparing stocks we find, however, that tops may be cut back at almost any time during the summer after the cessation of the free flow of sap and grafting may be done at the same time. Theoretically the plant physiologist knows very well that such a procedure would shock the tree, but so far as I can determine this shock is not a very serious one.

After the stock has been grafted it is important to break off shoots which start in advance of the starting of the scion buds. This must be continued until the scion buds have made several inches of growth. After that time stock shoots may be allowed to develop in order to help in furnishing pabulum for the root for the next year's growth. At the end of the third year all stock shoots should be removed permanently and only the growth of the graft permitted, provided the graft growth is large enough to balance the root.

Scions are preferably cut during the dormant season and put into cold storage or otherwise preserved until the time for their employment, but by means of the paraffin method it has been

possible for me to do a good deal of direct grafting experimentally, cutting scions directly from a growing tree and inserting them into a stock tree. When we employ the direct method of grafting, all new growth of the year is cut away from the scion and we depend upon older latent buds in the scion. The time for nut-tree grafting is preferably after the leaves are fairly well out and the free flow of sap is less than it is earlier in the season. Practically, I have successfully grafted hickories from March until the last week in July and find that the customary grafting season can now be extended from five weeks to nearly five months. The methods which are employed for grafting nut trees may also be used for other fruit trees.

This brief outline covers only the essential points in the process. More elaborate details will, however, be included in a small book to be published at an early date.

ROBERT T. MORRIS, M.D.

616 MADISON AVENUE,
NEW YORK CITY

EXPLANATION OF PLATE 250

FIG. 1. Inserting a hickory scion in the bark of a hickory stock. The slot is the same length and width as the portion of the scion to be inserted.

FIG. 2. A bark slot at the end of a cut branch. A bit of flat wood is pressed upon the tongue of bark in order to insure better pressure from the Spanish windlass.

FIG. 3. Spanish windlass applied and melted paraffin being brushed over the entire field of work, including all of the scion.

FIG. 4. Fixation of the scion by the use of raffia instead of the Spanish windlass.

FIG. 5. An ordinary side-cleft graft. Melted paraffin is being applied as stated under Fig. 3.

FIG. 6. A hickory demonstration stock showing ordinary cleft-grafting with raffia fixation and bark-slot grafting with Spanish windlass.

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# NOTES, NEWS AND COMMENT

Bulletin 39, with 94 pages of text, was issued June 30, 1920. It contains the annual reports of the Director-in-Chief and other officers of the Garden for the year 1919.

About seventy pupils from Curtis High School, Staten Island, spent the afternoon of June 25 at the Garden examining the museum collections and the plantations under the guidance of members of the staff.

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The library has recently been the recipient of a book entitled "Wild flowers drawn and colored from nature" by Mrs. C. M. Badger, with an introduction by Mrs. L. H. Sigourney. This handsome work, in quarto, with 22 hand-colored plates, is the gift of Mrs. Fannie Griscom Parsons.

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*Meterology for June.* The total precipitation for the month was 4.04 inches. The maximum temperatures were as follows: 91° on the 3d, *93° on the 11th* and *15th,* 88° on the 26th and 90° on the 28th. The minimum temperatures were *50° on the 5th, 6th* and *10th,* 52° on the 19th and 58° on the 23d.

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Dr. N. L. Britton, accompanied by Mrs. Britton, sailed for Europe August 7 on the Philadelphia. During his stay abroad he will visit various botanical institutions of Great Britain, France, and Switzerland in the interests of the Garden, particularly in furtherance of the rapidly developing investigation of the flora of northern South America.

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Bulletin 38, the fourth edition of the guide to the grounds, buildings and collections of the Garden, appeared June 24, 1920. It contains 125 pages of descriptive text, a general plan of the Garden, and 28 full page illustrations. Several important features have been developed since the publication of the last guide, particularly in the area of over 140 acres added to the Garden early in 1915.

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Vol. 9 (now complete), parts 1–7, 1907–1916. Polyporaceae—Agaricaceae (pars). (Parts 1–3 no longer sold separately.)

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Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916; part 2, 1917; part 3, 1918. Chenopodiaceae—Alliioniaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913; part 6, 1918. Podostemonaceae—Rosaceae.

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Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 32, part 1, 1918. Rubiaceae (pars).

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

**Memoirs of the New York Botanical Garden.** Price to members of the Garden, $1.50 per volume. To others, $3.00. [Not offered in exchange.]

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Vol. V. Flora of the Vicinity of New York: A Contribution to Plant Geography by Norman Taylor. vi + 683 pp., with 9 plates. 1915.

Vol. VI. Papers presented at the Celebration of the Twentieth Anniversary of the New York Botanical Garden. viii + 592 pp., with 43 plates and many text figures. 1916.

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# The New York Botanical Garden

EDITOR

H. A. GLEASON

*Assistant Director*

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At Chapel Hill, middle North Carolina, February 10, 1919. Weather conditions here depicted frequently extend to the coast. The progeny of plants sensitive to cold whose seeds are brought northward, commonly by birds, must of necessity migrate slowly and through long periods, especially if of recent origin, geologically speaking. Plants of the older species whose "blood" was used to the lower temperatures that existed southward during the glacial times doubtless migrated northward more rapidly. There is much material in the Coastal Plain, both in the case of cacti and other flowering plants to be studied from the stand-point of the

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# IN QUEST OF LOST CACTI

## "CACTUS HUNTING IN THE CAROLINAS IN WINTER

WITH PLATES 251 AND 252

The lures of the botanically historic coasts of North Carolina and South Carolina and recent reports of observations on prickly-pears growing there decided the writer to devote a few days' field work to that region in the first week of February, 1919. His experiences and a few incidental historical observations are recorded on the following pages.

His personal interest in the region was first aroused to high pitch during a collecting excursion about the environs of Charleston in February, 1917, when searching that country for several kinds of prickly-pears described from specimens collected there some sixty years ago, and since then wholly lost from view.

The species concerned were "*Opuntia tunoidea*," "*O. macrarthra*," "*O. vulgaris*," "*O. frustulenta.*" Specimens of these were exhibited by Professor Lewis R. Gibbes[1] at a meeting of the Elliott Society of Natural History held January 15, 1858, and formally named and described in the "Proceedings" of the society during the same year. This record was unobserved for many years, and unfortunately no herbarium specimens were made, or at least none have been preserved.

[1] Lewis Reeve Gibbes (1910–1894), a graduate in medicine, but professionally a teacher throughout his long career, was a native of Charleston and professor in the College of Charleston for fifty-five years. He was both mathematician and naturalist, and published but little upon any subject, but his ability as a botanist was well known and widely recognized. His herbarium is now incorporated with that of the New York Botanical Garden.—JOHN HENDLEY BARNHART.

The first search[1] in the Charleston country discovered three different kinds of prickly pears. These have since been associated with the botanical names that belong to them, namely: *Opuntia macrarthra* of Gibbes appeared to be a local endemic species and should bear the name Professor Gibbes associated with it. *Opuntia frustulenta* proved to be *Opuntia Drummondii* (*O. Pes-Corvi*) which was originally described from Florida in 1841, and also known from Georgia. *Opuntia vulgaris* of the Gibbes paper represented *Opuntia Pollardi*, a species collected in southern Mississippi in 1896, and described by Britton and Rose in 1908. The writer found this species growing abundantly in northern Florida in 1917.

In February, 1916, we traced the last species in the Atlantic coastal plain as far north as Charleston, and last year a fragmentary specimen of a prickly-pear collected on Currituck Sound, northeastern North Carolina, by Mr. W. L. McAtee,[2] indicated the occurrence of the species in that region also.

This latter discovery and the finding of a new locality for it near Charleston, South Carolina, by Miss Laura M. Bragg[3] influenced us to undertake an excursion to the coasts of the Carolinas mainly for the collection of prickly-pears.

We left New York at midnight, February 1, and spent the day studying plant collections in Washington. The night boat from Washington to Norfolk brought us near the beginning of our

[1] Described under "Cactus Hunting on the Coast of South Carolina" in *Journal of the New York Botanical Garden* 18: 237–246. 1919.

[2] Waldo Lee McAtee (1883– ) is a native of Indiana, and a graduate of the state university of that commonwealth. While still an undergraduate, he was curator of the university museum, and upon graduation entered the service of the United States Biological Survey, in which he is still engaged. He is primarily an ornithologist, but has always been interested in plants as well as birds, publishing accounts of the flora of comparatively inaccessible islands on the coasts of Maine Massachusetts, Virginia, and Florida, and a number of brief notes upon various botanical topics.—JOHN HENDLEY BARNHART.

[3] Laura Mary Bragg (1881– ), the curator of books and public instruction of the Charleston Museum from 1909 to 1919, and now director, is a graduate of Simmons College, Boston, in the class of 1906. She is an enthusiastic amateur botanist, and besides her contributions to the Bulletin of the Charleston Museum, is the author of a list of the ferns of the vicinity of Charleston, printed in the fourth volume of the American Fern Journal.—JOHN HENDLEY BARNHART.

field-work early Sunday morning. The early forenoon found us at Snowden, North Carolina. Snowden is not a metropolis, so several hours had to be wasted in finding some mode of transportation to carry us to our objective some fifteen or twenty miles eastward. Finally the sole horse and buggy of the region was located and the use of both was secured for the rest of the day.

About Snowden the weed crop of the coming season was beginning to appear rather prematurely, but luxuriantly, and the cultivated fragrant honeysuckle (*Lonicera fragrantissima*) was in full bloom. The few pleasant days about the time of this visit had followed a spell of several weeks of rainy weather and a six-inch fall of snow. As a result of the inclement weather, much of the naturally low country west of Currituck Sound was partly under water and the roads were in very bad condition. The horse pulled us through, however, and we finally achieved Waterlily, a small settlement on Church's Island, by passing over a causeway thrown up in dredging a canal. Thence we went northward about a mile, following instructions, and on the sand-dunes at the narrowest part of the island, among the tallest pine trees of this region, we found large colonies of the plant we sought, *Opuntia Pollardi*. There were, naturally, no flowers, but fruits were plentiful.

The definite knowledge of this plant in northeastern North Carolina extends the range fully three hundred and thirty miles north of its former known limit and brings it nearly to the Virginia-North Carolina state-line.

Although it was mid-winter, the landscape was not altogether barren and desolate. In the lower lands, in the swamps particularly, various shades of green exhibited by the evergreen heaths and hollies, were attractive and ever-changing. Flowers, too, were not wanting. All the swamps were copiously decorated with the drooping yellow staminate aments of the alder (*Alnus*) and several heaths had their flower-clusters ready to expand without much delay.

After securing our prize we started back. We had had a pleasant drive earlier in the day; but shortly before sunset,

while returning, the wind shifted and the temperature fell to a painful degree. The mud-puddles and pools encountered on the way out had now become iced, and the drive against the bleak wind had to be interrupted with spells of walking and running in order to keep ourselves from being thoroughly, if not seriously, chilled. By keeping ourselves and the horse moving we reached the railroad in time to catch the night express for the south. Daybreak found us in New Bern, North Carolina, one of the classic botanical fields of the earlier part of the last century.

New Bern is a port of entry, at the confluence of the Neuse and the Trent Rivers, which form an estuary extending fifty miles to Pamlico Sound. It was settled over two hundred years ago by Swiss and German immigrants, who named it for Bern, Switzerland. It later became the capital of the province of North Carolina, and here William Tryon, one of the governors in charge shortly prior to the American Revolution, built what is said to have been the finest residence in the colonies. His name is perpetuated in Tryon Mountain in western North Carolina. This mountain harbors at least one endemic plant (*Psoralea macrophylla*), and it is also one of the southern localities for the northern prickly pear (*Opuntia Opuntia*).

Subsequent to the Revolution, New Bern produced its only two resident botanists. The career of one, H. B. Croom,[1] is

[1] Hardy Bryan Croom (1797–1837), a wealthy planter, was born in Lenoir County, North Carolina, October 8, 1797. He graduated at the University of his native state in 1817, studied law with Hon. William Gaston, and was admitted to the bar, but practiced his profession for only a short time; he married about 1820, and made his home at New Bern. About 1832 he rented a plantation in Florida, on the west bank of the Apalachicola River, opposite Aspalaga, and it was in this vicinity that he discovered *Tumion* (*Torreya*) and *Croomia* early the following year. In 1834 he purchased and began the development of a plantation in Leon County, near Tallahassee, and there he spent a few months of each year, leaving his family in North Carolina. In January, 1837, he purchased the former home of Joel Roberts Poinsett (1779–1851), for whom the genus *Poinsettia* was named, in Charleston, South Carolina, intending to make it his permanent residence. During the summer of the same year he brought his family, as was his custom, to New York City, and in October sailed for Charleston in the steam-packet "Home." This was a new vessel, the finest that had ever been built for the coastwise service; but it was wrecked off Ocracoke Inlet, south of Cape Hatteras, on the second day out (October 9, 1837), and Croom and his entire family, wife, three children, and maid, perished. His charming personality and scholarly attainments intensified the

well known. His botanical interests extended as far as western Florida where he discovered, among other rare plants, one which bears the name of *Croomia* and whose only relatives occur in eastern Asia and Australia. Mr. Croom was evidently the most wide-awake native botanist in the southern states during the earlier decades of the last century. It has been recorded[1] that "Mr. Croom was an ardent lover of Botany and a successful cultivator of the science. In his annual visits to Florida, he availed himself of the opportunities which he enjoyed of examining the vegetable productions of the interesting regons through which he passed. . . . His principal herborizations were conducted in the vicinity of Newbern; and in middle Florida, particularly in the vicinity of Tallahassee, and along the Appalachicola River. . . .

"Mr. Croom had projected a plan for extensive botanical explorations in Florida; . . . . "

The career of Croom's associate, H. Loomis[2] is almost unknown.

Although subsequent native or resident botanists failed those parts, succeeding generations were evidently interested in plants, as is evidenced by the specimens of shrubs and trees extant in the gardens about the older houses in New Bern.

The more conspicuous trees in the gardens were fine old trees of *Cunninghamia* just coming into flower and old giants of the crape-myrtle (*Lagerstroemia*). On the roadsides and in vacant lots violets (*Viola*), barren-strawberry (*Duchesnea*), sour-grass

sorrow of Torrey, Gray, Chapman, and his other botanical friends. Besides his catalogues of the plants of New Bern, Croom had contributed several papers to the American Journal of Science and Arts, and one to the Annals of the Lyceum of Natural History of New York. Death, however, claimed him when he seemed on the very threshold of an unusually productive botanical career. A monument to the memory of Croom and his family stands in front of the Episcopal church at Tallahassee.—JOHN HENDLEY BARNHART.

[1] John Torrey in preface to A Catalogue of Plants, Native or Naturalized, in the vicinity of New Bern, North Carolina.

[2] H. Loomis, who collaborated with Croom in the preparation of his first catalogue, was at that time (1833) a physician at New Bern. Shortly afterward, in or before the year 1835, he removed to Macon, Georgia, and it was probably at Macon that he died, about December, 1837. At least two species of plants, *Pycnanthemum Loomisii* Nutt. and *Lysimachia Loomisii* Torr., bear his name.—JOHN HENDLEY BARNHART.

(*Xanthoxalis*), dandelion (*Leontodon*), spurge (*Chamaesyce*), and henbit (*Lamium*) were blooming. Annual grasses were in flower, while perennial grasses were just beginning to put forth their new leaves. Among the cultivated plants then in bloom, violets (*Viola*), daffodils (*Narcissus*), chrysanthemums (*Chrysanthemum*), and tick-seeds (*Coreopsis*) were represented.

We arrived at Wilmington, North Carolina, about noon. This, like New Bern, is classic botanical ground. The city is situated on the left, or east, bank of the Cape Fear River about thirty-four miles from its mouth at Cape Fear, but only about fifteen miles from the coast to the eastward.

Wilmington is younger than New Bern by twenty years. Although it was not favored as the residence of a colonial governor, it was geographically a better seaport, and it soon outgrew its neighbor. It, too, can boast of a longer list of native, resident, transient and itinerant botanists.

Among the last, in the early part of the last century, may be mentioned H. B. Croom who has already been referred to and William Baldwin.[1] As a surgeon in the navy, Baldwin's duties took him to Wilmington, North Carolina and Wilmington, Delaware, which were both naval stations. In his preserved correspondence to botanical friends, it is sometimes difficult to tell from which Wilmington he wrote his letters.

The transient botanist of Wilmington was the celebrated Frenchman A. R. Delile.[2] He, however, left little or no permanent botanical record of his sojourn in that region.

[1] William Baldwin (1779–1819), a medical graduate of the University of Pennsylvania and a surgeon in the United States navy, was an enthusiastic student of the flora of the southern states. In 1805–06 he visited China, and in 1817–18, South America, but more than half of the last decade of his short life was spent in Georgia and neighboring states.—JOHN HENDLEY BARNHART.

[2] Alire Raffeneau-Delile (1778–1850) was a native of Versailles, France; when only twenty years of age he was one of the scientists chosen to accompany the Napoleonic expedition to Egypt, and was placed in charge of the botanic garden then established at Cairo. From 1803 to 1805 he was French vice-consul at Wilmington; he then studied medicine in New York City, receiving his M.D. degree from Columbia College in 1807, and returned to France in the same year. The last thirty years of his life were spent as professor at the university of Montpellier, and director of the botanic garden there. He is best known for his elaborate works on the flora of Egypt.—JOHN HENDLEY BARNHART.

The resident botanists who have contributed to the local plant literature were M. A. Curtis,[1] a clergyman who studied the flora of other parts of the State as well, and Gerald McCarthy[2] who for many years was associated with the State department of agriculture.

The native botanists are represented by J. F. McRee[3] and T. F. Wood.[4] Both these men were primarily physicians, but they have left us their record as botanists too.

Among the above-mentioned botanists, M. A. Curtis is most

[1] Moses Ashley Curtis (1808–1872) was a native of Stockbridge, Massachusetts, and a graduate of Williams College in the class of 1827. In 1830 he went to Wilmington, North Carolina, as a tutor, and from his first arrival devoted all his spare time to the study of the flora of the region, of which he published an enumeration in 1835. From 1835 until his death he was an Episcopalian clergyman, most of the time engaged in missionary work in various parts of North Carolina, although for nine years, 1847–56, his home was at Society Hill, in South Carolina. His reputation as a botanist was based almost entirely upon his work with fungi, but he never lost his interest in the study of flowering plants, publishing a catalogue of the plants of North Carolina as late as 1867.—JOHN HENDLEY BARNHART.

[2] Michael Gerald McCarthy (1858–1915) was for many years a student of the flora of North Carolina. When he first began to write upon the subject, about 1884, he was a student at Gallaudet College, Washington, D. C., where he graduated in 1887; when the office of botanist to the North Carolina Agricultural Experiment Station was created, in 1888, he was appointed to the new position, which he occupied for nearly ten years; in 1897 he became botanist and biologist of the North Carolina Board of Agriculture, retiring in 1907. Throughout these twenty years, 1888 1907, he was looked upon as "state botanist" of North Carolina, although no such office actually existed. In 1904 Gallaudet College conferred upon him the honorary degree of Doctor of Science.—JOHN HENDLEY BARNHART.

[3] James Fergus McRee (1794 -1869) was born near Wilmington, North Carolina, and resided in or near Wilmington all his life. He received the degree of M.D. from the College of Physicians and Surgeons of New York in 1814, and practiced his profession, with one brief interval, from that time until 1846, when he retired. His study of botany began at an early age, and continued throughout his life. His advice and friendship, and the free use of his botanical library, were of great value to Curtis, who named *Galactia Macreei* in his honor.—JOHN HENDLEY BARNHART.

[4] Thomas Fanning Wood (1841–1892) was born and died at Wilmington, North Carolina, where he was a physician for many years. His professional education was secured at the Medical College of Virginia, at Richmond, and he received the degree of LL.D. from the University of North Carolina in 1889. He was active in the work of the medical society, the board of health, and the board of medical examiners of his state, and the American Medical Association. During the Civil War he was an assistant surgeon in the Confederate army.—JOHN HENDLEY BARNHART.

widely known, largely through the specimens he distributed. In the latter part of his career he conceived an idea the realization of which would have given him wider renown. However, the execution of this idea fell to the lot of A. W. Chapman[1] who crystallized it in his "Flora"—a truly remarkable work when we stop to consider all the circumstances under which it was written and produced.

At Wilmington we had the coöperation of Mr. D. W. Gross,[2] Corporation Engineer of the Atlantic Coast Line Railroad Company. Mr. Gross is well acquainted with the environs of Wilmington and consequently no time was lost in locating the cactus that is common in that region. Up to this time the weather had been clear, but now rain set in and continued for three days.

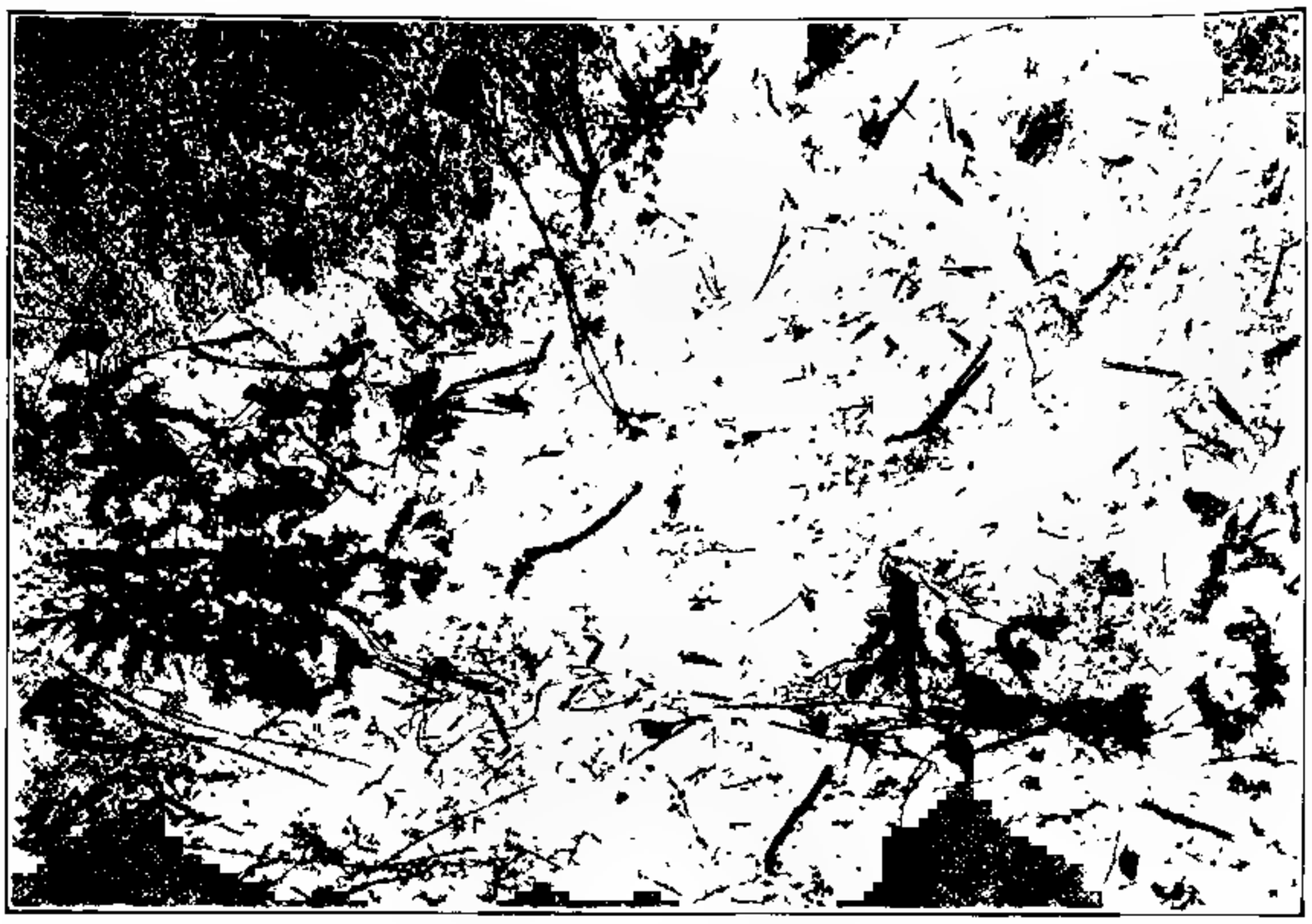
The bluffs of the inlets along the coast east of Wilmington were first investigated. There the crow-foot prickly-pear was found growing in greater luxuriance than we had seen it elsewhere.

Observations there concerning the flowering and fruiting of this plant confirmed those formerly made at Apalachicola, Florida. These make clear on the one hand the reason for the idea prevalent among the inhabitants where *Opuntia Drummondii* grows naturally, to the effect that the plant makes neither flowers nor fruits, and, on the other hand, the interesting way the plant has developed of adapting itself to different environments.

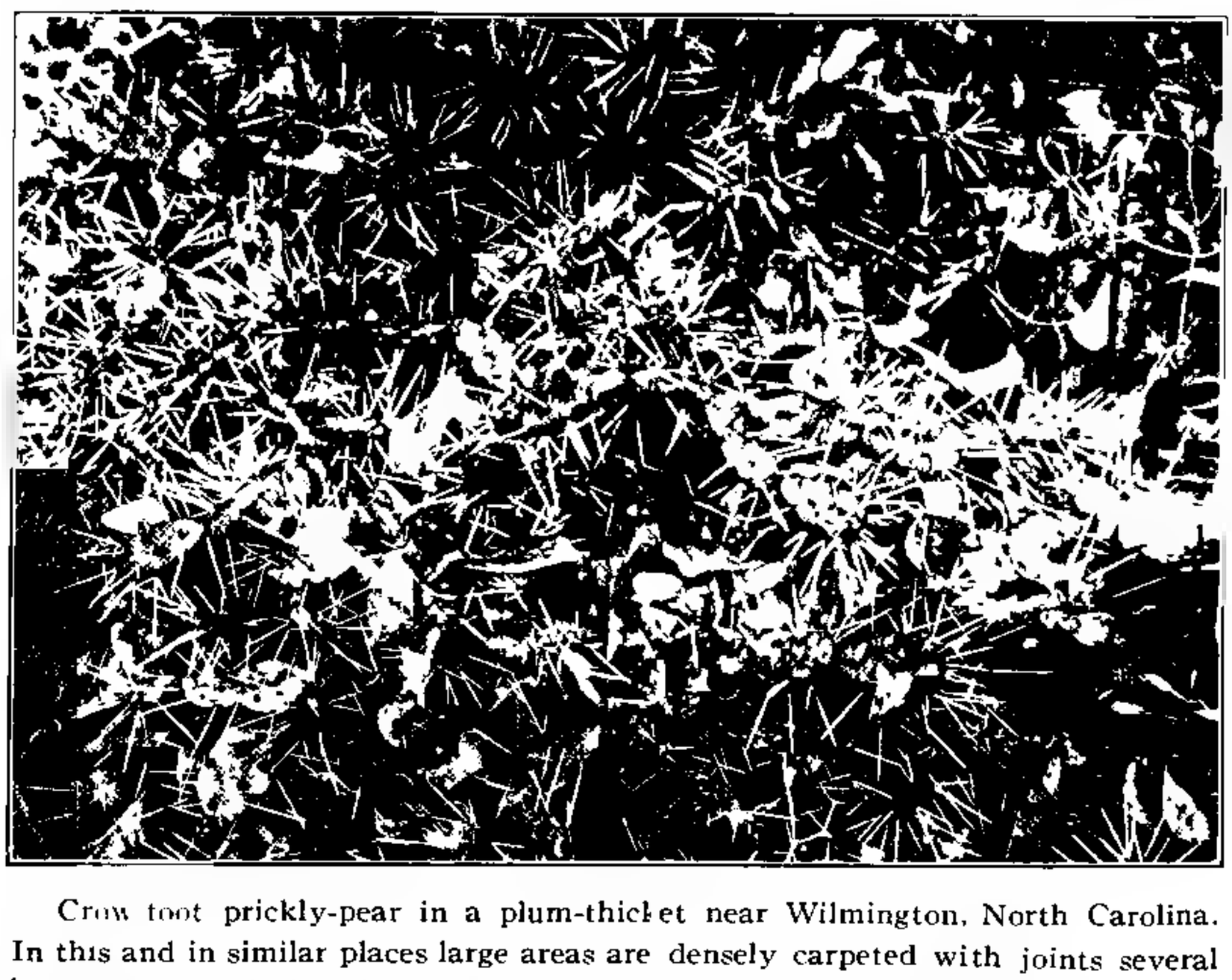
In all our experience with the crow-foot prickly-pear in North Carolina, South Carolina, Georgia, and Florida, we had never

[1] Alvan Wentworth Chapman (1809 1899) was a graduate of Amherst College who went to Georgia as a teacher, studied medicine there, and soon afterward entered upon the practice of his profession in Florida. For more than half a century his home was at Apalachicola, where he died in his ninetieth year. His "Flora of the southern United States," first published in 1860, and running through several editions, was for nearly fifty years the only manual of the flowering plants of the southeastern states.—JOHN HENDLEY BARNHART.

[2] Daniel Wingerd Gross (1871 - ) is a Pennsylvanian by birth, and graduated as a civil engineer from Pennsylvania State College in 1893. He has been engaged in railroad engineering work ever since, and is now located at Wilmington, North Carolina, as Corporation Engineer of the Atlantic Coast Line. He has always been interested in the botany and zoology of the regions he has visited, or those where he was stationed. -JOHN HENDLEY BARNHART.



Crow-foot prickly-pear, specimens originally from the coast of South Caro.ina, on an artificial sand-dune in the cactus plantations at Buena Vista, Florida. This figure shows how the plant grows on the coastal dunes from North Carolina to Florida. The growth is usually more scattered than here shown, and the plants are barren, perhaps as a result of the slight nutriment in the shifting sands.



Crow foot prickly-pear in a plum-thicket near Wilmington, North Carolina. In this and in similar places large areas are densely carpeted with joints several layers deep, and the plants are very fructiferous. Although the joints are as loosely attached to each other as they are in the case of plants on the dunes, the effectual protection from sweeping winds and meandering animals encourages a dense growth which is augmented by the accumulation of more nutriment in the form of humus.

before found it fruiting in its typically natural habitats, that is, on the active sand-dunes along or near the coast. There it grows plentifully, both in exposed and in naturally sheltered positions. However, in artificially protected places, such as dense plum-thickets, which perhaps represent former settlements of the aborigines, on ruined walls of old buildings, and in partly filled cellars, the plants grow in dense masses, often with the joints several layers deep, and there they produce great quantities of fruit. We cannot speak directly for the flowers, as we have not observed this prickly-pear during the flowering season; but the fruits are, naturally, the results of the flowers. Thus *Opuntia Drummondii* behaves in two ways in the matter of perpetuating its kind. Each joint represents the direct possibility of a new plant independent of flower and fruit. In a natural habitat these joints, being so loosely articulated, are easily separated from each other, carried about and distributed. Thus joints are transplanted both by the wind and by the numerous native animals that inhabit and travel about the region. Consequently, we find the species extensively and often quite evenly distributed on the sand-dunes, particularly along and about the trails of animals,however, never in particularly massive accumulations, but apparently always fruitless. Just why this condition should obtain is not wholly clear, but it may be a matter of nourishment. It has been observed that the soil of the present natural habitats is poor. The available nourishment is clearly below that which the plant could use. The plants are plentiful, but the joints are small, often very small, and have the appearance of being undernourished. In this condition they fail to produce flowers.

In the artificially sheltered habitats we find a different state of affairs. There, where the plants are protected from the wind and from the meandering native animals, we find colonies growing in dense masses and copiously fruited. It would seem that the joints increase just as copiously as they do in the natural habitats, but instead of being scattered they are piled up in masses. That the plants derive more nourishment from the soil in the artificial habitats is evidenced by the much larger

size and healthier condition of the joints. Hence, under the stimulus of sufficient nourishment there the plants propagate sexually as well as vegetatively.

Prickly-pear fruits, or rather the seeds, are much sought after by birds, in fact some birds seem to be ravenously fond of them. Thus it might be argued that the birds destroy the fruits in the natural habitats of this plant. This might be a reasonable argument were it not for the fact that in localities where the three species, *Opuntia Drummondii*, *O. macrarthra*, and *O. Pollardi* grow together, there is present a plenty of fruits of the second and third cited species, while the first is barren! And further, the fruits of *O. macrarthra* and *O. Pollardi* are much more accessible to a bird on account of the decidedly less vicious armament of the joints of those two species.

The second day at Wilmington was devoted to the coastal dunes at a point called Figure Eight Woods. This locality is characterized by a copious growth of red-cedar and various other woody plants. The red-cedar is the dominant tree, at least in size; the other woody growth is much stunted and there are extensive forests with a maximum height of two or three feet. These miniature trees were mostly red-bay (*Tamala*), yaupon (*Ilex vomitoria*), and Dahoon-holly (*Ilex Cassine*). All through these diminutive forests were the trails of small native animals and along and near them were endless patches of the crow-foot prickly-pear. The main object of our investigation of these dunes was to discover the long-joint prickly-pear (*Opuntia macrarthra*), heretofore known only from the Charleston, South Carolina region. In this we were disappointed.

In many places the sand of the dunes was covered with sand-loving mosses that had recently put forth much new growth. Other areas were clothed with a carpet of the partridge-berry (*Mitchella repens*). A striking Adam's needle (*Yucca*) grew everywhere on the dunes. It had stiff spatulate leaves, but it was neither in flower nor fruit. This region is outside of the hitherto known geographic range of the genus *Yucca*. This fact, taken in connection with the unique leaves, indicates that it very likely represents an undescribed species. In sheltered

places the ebony-spleenwort (*Asplenium platyneuron*) grew luxuriantly with very tall leaves. Withered or half-withered leaves measured nearly two feet in length, while vigorous new leaves had started for the coming spring's growth. The interesting vine all through the diminutive forests, aside from the native species of horsebrier (*Smilax*), was the Japanese-honeysuckle (*Nintooa japonica*). In all appearances this was a native vine; but the seeds were evidently introduced there by birds, and finding a congenial habitat, the plant not only perpetuated itself, but it appears to be spreading extensively. The maritime environment has produced a different looking plant from the ordinarily cultivated form.

Between Wilmington and the coast we passed through large areas of marsh that several months later would be covered with the blossoms of the celebrated Venus fly-trap (*Dionaea*). This interesting plant is often reported to be on the verge of extermination; but it is still plentiful about Wilmington, and we have lately received reports of extensive areas of it about ninety miles inland. Many of the introduced and native plants observed in bloom at New Bern were also flowering at Wilmington. In addition the bluets (*Houstonia minima*) were flowering in the low woods east of the city.

A combination of circumstances defeated our plan to stop at Georgetown, South Carolina, so we went from Wilmington to Charleston. Although we did not go to Georgetown, we have a record of an observation on a prickly-pear made there by Mr. W. L. McAtee of the Biological Survey. He says in a letter: "In your investigations of cacti, you might wish to look up one I saw near Georgetown, South Carolina. It was of ascending habit, one and a half to two feet high, with long, nearly spineless joints. It grew on sand hillocks amid the coast marshes of localities known as Cedar Island and Murphy's Island." This record clearly indicates *Opuntia macrarthra* of Gibbes, heretofore known only from the vicinity of Charleston.

In Charleston we were brought face to face with the main task of our trip, namely, the rediscovery of Gibbes' *Opuntia tunoidea*. While at Charleston we had the facilities of the

Charleston Museum, through the kindness of Professor P. M. Rea,[1] the Director, and Miss Laura M. Bragg, Curator of Public Instruction, successfully arranged for all the field work.

The first task undertaken was that of looking up the mysterious prickly-pear located by Miss Bragg a year ago. Our objective lay about thirty miles southwest of Charleston. A well-nigh impossible road separated us from our goal; but we made the attempt and accomplished our errand. We have participated in some exciting motor trips in peninsular Florida and elsewhere, but this one eclipsed them all. What we needed was an aëroplane instead of an automobile. We started out with a new automobile and brought it back an apparent wreck, and, in addition, thoroughly camouflaged. Long stretches of the road were submerged beneath a foot or eighteen inches of fluid mud. In order to get through, it was necessary to charge these sloughs at high speed and take a chance between reaching the other side safely or ditching the car. Fortunately, we came out all right. We do not know what was buried under the mud, but often the car would strike objects that would throw it out of the mud; thus sometimes the car was on the ground and sometimes in the air. However, it always came down right side up, and we still survive. Black and blue spots from head to foot, broken watch-crystals and smashed fountain pens were the chief penalties of the ride, and only once were we buried so deep in the mud that we had to call on the fortunately nearby State chain-gang to come with shovels and dig the car out! However, the severity of the jolting may be best illustrated by the statement of one of the ladies who rode on the back seat of the car, and her veracity is ordinarily unimpeachable. She claimed that before we were half way to our destination both her rubbers were joggled off

[1] Paul Marshall Rea (1878– ), director of the Charleston Museum from 1903 to 1920, professor of biology in the College of Charleston from 1903 to 1914, and professor of embryology and physiology in the Medical College of South Carolina from 1911 to 1920, is a native of Massachusetts and a graduate of Williams College. Before his appointment at Charleston he was assistant in biology at Williams, and a field assistant in the Bureau of Forestry. He was one of the founders of the American Association of Museums; its secretary, and as such the editor of its Proceedings, from 1907 to 1918; and is president of the association for the current year, 1919–20.—JOHN HENDLEY BARNHART.

and by the time we reached Rockville the laces of her shoes were untied!

Rockville is located on the southernmost point of Johns Island. It lies on a small promontory on the North Edisto River facing directly south, and opposite the eastern end of Edisto Island. It was named Rockville, perhaps, so that the imagination could furnish the rocks to break the monotonous environment, which is made up of sand and water.

When we alighted from the motor-car, the reward of the strenuous ride was before us, and the last mystery of the Gibbes quartette of prickly-pears was solved.

We walked out to the shore and there, with our backs toward the few houses, we might just as well have been standing on Cape Sable, Florida, or some of the Florida Keys six hundred miles further south, not only as regards the view, but as regards the vigorous plants of the large *Opuntia Dillenii* of tropical America, or a species so much like it in vegetative character that without either flowers or fruits it is indistinguishable. It represents Gibbes' *Opuntia tunoidea*, which had not been collected for a period of sixty-odd years. The flowers and fruits have yet to be seen, and must be secured before its real specific relationship can be determined.

The largest plant, growing as a circular bush about ten feet in diameter, had been for the most part destroyed by the building of a house on the site. The disarticulated remains were scattered widely over the lawn-like dune and they were, naturally, taking root. The larger intact specimens were growing near the tide-line, while smaller ones grew in the partial shade of shrubs and trees near the crest of the low dune. In the case of larger plants, joints up to eighteen inches or more were not uncommon. Their armament was just like that of Dillen's prickly-pear of Florida and the West Indies.

After securing enough specimens for growing in the cactus plantation at Buena Vista, Florida, and in the conservatories at the New York Botanical Garden and at Washington, we regretfully began our homeward journey; not that we regretted leaving Rockville, but what we looked forward to on the motor

trip before us. We did not feel safe until we had successfully charged the last sea of mud just outside of Charleston. Fortunately for us and also the cause of *Cactus*, we made the return without any casualties.

The following day was devoted to the eastern end of James Island in the vicinity of the Quarantine Station, through the courtesy of the Officer-in-Charge, Dr. H. M. Manning.[1]

Prickly-pears were abundant on the sand-dunes on that part of the island. The large one we collected at Rockville, however, was not represented; but the other three species of the region grew promiscuously all over the dunes. They are: *Opuntia Drummondii*, *O. Pollardi*, and *O. macrarthra*. Although these species grew intimately intermixed, there was no sign of intergradation nor hybridization. The first-named species was without fruit, while the joints of the second and third still held the berries of the past season in many cases. The joints of *Opuntia Pollardi* and *O. macrarthra* furnish a staple food for rabbits. These animals had dexterously eaten the epidermis and some of the pulp of the joints, carefully avoiding the areolæ or bristle-cushions, thus often giving quite a variegated effect to the plants. The joints of cock-spur cactus (*Opuntia Drummondii*), although just as succulent and nutritious, were untouched, apparently on account of their being more copiously spine-armed.

Prickly-pears thus support animal life in several ways. The fruits, particularly the seeds, are a favorite food for birds, the joints maintain cattle and rabbits, and perhaps related animals, while we have seen signs of the tubers of some species being eaten by rodents. The tubers, which are borne in great quantities by some species, would doubtless furnish a starch which would be useful to man.

[1] Herbert Miller Manning (1878– ) is a graduate of the medical school of Columbian (now George Washington) University, of the class of 1900. In 1903 he entered the Public Health Service of the United States, and in his capacity as a health officer has been stationed at various ports: in Hawaii and the Philippines, at New York, at New Orleans, at Key West, and for several years past, at Charleston, where he was also professor of tropical medicine in the medical college. He is now in charge of the marine hospital at Memphis. Bacteriology has been Dr. Manning's specialty in botany.—JOHN HENDLEY BARNHART.

The same cultivated plants and weeds found blooming at New Bern were also observed at Charleston. The old brick walls in town furnished good collecting ground for mosses and hepatics. An interesting moss (*Desmatodon plinthobius*) was first found on these walls about the middle of the last century. We collected it on similar walls in passing through New Bern. The brick walls of Charleston are often conspicuous ferneries. Two kinds of ferns are usually present, the Huguenot-fern (*Pteris multifida*) and the ebony-spleenwort (*Asplenium platyneuron*). The former was the more common of the two. It is called the Huguenot-fern because of a tradition that it was brought to South Carolina by the Huguenots. However, there is little or no evidence to support this tradition.[1] Another favorite tradition is prevalent in the same region. It is commonly believed that the little Japanese bush-clover (*Lespedeza striata*) was introduced into South Carolina and other southern states during the Civil War period; but it is really known to have been thoroughly naturalized, at least in Georgia, a quarter of a century previous to the outbreak of the Civil War.

The first definite record of the Huguenot-fern in the United States was its discovery on brick foundations in 1868 by Professor Lewis R. Gibbes. Since then it has taken possession of all kinds of brick walls, often growing in masses that completely hide the bricks. However, it was not common there this year, for the extreme cold weather of the winter of 1918 had wholly or partly killed the growth on many walls where it once was abundant. It is now not confined to Charleston, but has been found as far inland as Columbia, as well as at intermediate points.

The other interesting fern, the native ebony-spleenwort, grew less plentifully than its associate. However, on first thought, one would not consider it *Asplenium platyneuron*, the artificial habitat evidently encouraging a quite abnormal habit of growth and size. Compared with specimens of the same species we found at the coast-region of Wilmington, North Carolina, in a natural habitat, the differences were quite marked, not to say misleading.

[1] For a full discussion of this plant see L. M. Bragg, in Bulletin of the Charleston Museum 10: 19–21, 1914.

Having accomplished the objects of our visit to Charleston, we set out for the final objective in the Carolinas, namely, Chapel Hill, North Carolina. One evening we left Charleston, with its almost summer weather, and reached Selma, North Carolina, early the next morning just in time to see the train that was to take us to Raleigh pull out of the station. Thinking not to be delayed in reaching Chapel Hill, we procured a motor-car at Selma and started for Raleigh thirty-two miles distant. Then the weather conditions changed; with every mile we could notice a fall in the temperature. Upon reaching Raleigh snow began to fall and soon six inches of soft snow covered the whole country. No kind of transportation from Raleigh to Chapel Hill could be secured until the arrival of the regular evening train. This brought us about dark to Durham, whence we proceeded to our destination by motor-car over a long road covered with snow—a rather exciting, not to say perilous, ride.

Plans for field work at Chapel Hill were defeated by the snow storm just referred to, but a profitable day was spent in the arboretum, laboratories, and herbarium of Professor W. C. Coker[1] at the University. The following day found the writer back in New York and at the Garden, and curiously enough in a milder climate than that of the then frigid South.

To sum up: The presence of the southern prickly-pear (*Opuntia Pollardi*) on the dunes of Currituck Sound, northeastern North Carolina, as suggested by the fragmentary specimens previously collected there, was definitely established. This species, as well as its frequent associate, *Opuntia Drummondii*, which has been found as far north as Okracoke Island in Pamlico Sound, North Carolina, is to be expected on the sand-dunes in Virginia south of Cape Henry, if not north of Cape Charles.

However, the most satisfactory result of the excursion was

[1] William Chambers Coker (1872– ) is a graduate of the University of North Carolina, where he has been professor of botany since 1902. He had received his degree as doctor of philosophy at the Johns Hopkins University the preceding year, and spent the interval in study at Bonn. Professor Coker is a member of many scientific societies, and is well known by his contributions to botanical literature. He was president of the North Carolina Academy of Science in 1909, and has been editor of the Journal of the Elisha Mitchell Scientific Society for more than fifteen years. —JOHN HENDLEY BARNHART.

the clearing up of the last mystery in connection with the species of *Opuntia* described by Professor Gibbes over sixty years ago, thus settling the questions raised by the interesting, but much neglected paper, referred to in a former report,[1] that have hung in the balance for several generations.

In the paper referred to, Professor L. R. Gibbes describes and names four kinds of prickly-pears he found growing naturally about Charleston, South Carolina. As we have finally found all of the Gibbes' plants, it may be well to repeat what Gibbes said concerning them and refer them to their proper species. Taking them up in the order recorded by Gibbes we have:

"The first, which we will call *Opuntia tunoidea*, falls under Engelmann's subgenus *Platopuntia*, section Grandes, is erect, or suberect, with large ovate joints, armed with yellowish spines, tipped with brown, about three quarters of an inch long. The flower and fruit we have not yet procured."—This represents the plant we secured at Rockville. We, too, have not seen the flowers or fruits; but the plant in its vegetative condition cannot be separated from the tropical *Opuntia Dillenii*.

"The second, which we call *Opuntia macrarthra*, falls under the same section with the preceding, and seems to be near *Opuntia angustata* of Engelmann, from the west of the Rio Grande; a prostrate species, joints from ten to fifteen inches long and three inches wide, one third of an inch thick, no spines, fruit two and a half inches long, slenderly clavate."—This is the endemic species of the middle South Carolina coastal region. Gibbes describes it as spineless, but like most of the spineless prickly-pears, odd plants or individual joints may sometimes bear a few spines.

"The third species is *Opuntia vulgaris*, the *Cactus Opuntia* of Elliott, and others, common throughout the State."—This really represents *Opuntia Pollardi*, a species of the coastal plain now known to range from northeastern North Carolina to southern Mississippi. The species it was long confused with—*Opuntia Opuntia*—is confined to the mountains and to the Piedmont region.

[1] Journal of the New York Botanical Garden 18: 243, 244. 1917.

"The fourth, which we will call *Opuntia frustulenta*, probably falls under Engelmann's section Xerocarpaceae, of the same subgenus; plant prostrate, joints subcylindric, two to six inches long, armed with spines, white, one fourth of an inch long, large for the size of the plant, joints separating readily."—This represents *Opuntia Drummondii* (1841) and *Opuntia Pes-Corvi* (1860), described originally from Florida and now known to range along the coastal sand-dunes and the immediate vicinity from North Carolina to western Florida, and perhaps into Alabama.

Our experiences in the Carolinas suggest the possibilities of the extension of the geographical ranges of some of the typically southern prickly-pears into Virginia, and even into Delaware, where the genus *Opuntia* is now known to occur in the wild state. Specimens have not yet been collected and we consequently do not know if the plants represent one of the southern species, extending northward in the coastal plain, as we would naturally expect, or if they represent the common prickly-pear (*Opuntia Opuntia*) extending into the coastal plain from the adjacent Piedmont plateau.

JOHN K. SMALL

## GEORGE W. PERKINS

George W. Perkins, a member of the Board of Managers of the New York Botanical Garden since 1900, died, after a brief illness, on June 18, 1920.

Mr. Perkins was greatly interested in parks and gardens and he was a lover of plants. He frequently visited the New York Botanical Garden and contributed liberally to all special funds for construction and development; his advice on many subjects has been valuable to the institution. In recent years, his time for public service has mostly been given to the establishment and development of the great Interstate Palisades Park in New York and New Jersey, a splendid monument to his indefatigable activity and good judgment.

*Resolved:* That his associates in the management of the New York Botanical Garden deeply mourn his loss and direct that this preamble and resolution be entered upon their minutes, printed in the JOURNAL of the Garden, and that a copy be sent to his bereaved family.

Approved by the Executive Committee, July 22, 1920.

N. L. BRITTON,
*Secretary*

## NOTES, NEWS AND COMMENT

Dr. Mario Calvino, of the Agricultural Experiment Station, Santiago de las Vegas, Cuba, visited the Garden August 11 enroute to Europe.

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Professor Charles J. Chamberlain, of the University of Chicago, paid a visit to the Garden August 11 on his way to the meeting of the British Association for the Advancement of Science, where he is to deliver an invitation address on the subject of "Cycads."

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Dr. W. A. Murrill visited Hollins College, near Roanoke, Virginia, on July 31 and August 1, where he was invited to make several parlor talks on popular botanical and horticultural subjects.

T. V. Rand and H. E. Thomas, former students of the Garden, received the degree of Ph.D. from Columbia University at its commencement last spring.

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About sixty pupils in the summer school of Columbia University, accompanied by Mr. L. W. Crawford, Jr., visited the Garden on the afternoon of August 9 and were shown through portions of the grounds and buildings by Dr. Barnhart, Dr. Seaver, Dr. Pennell, and other members of the Garden Staff.

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A set of western American mistletoes—specimens of *Razymoufskya* and *Phoradendron*—distributed by Professor James R. Weir has been incorporated in the herbarium.

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A gift of several dozen specimens representing the commercial varnish resins brought together by Messrs. Nobles and Hoare of London, has been received for the Economic Collections from Messrs. Pomeroy and Fischer of New York.

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A collection of nearly five hundred specimens of flowering plants from southern Oregon and Mt. Jefferson, California, made by Professor M. E. Peck, has been added to the herbarium.

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Many readers of the JOURNAL will be interested in the new quarterly magazine *Ecology*, the official organ of the Ecological Society of America. Dignified in appearance and authoritative in tone, the magazine will present the results of the latest research in the ecological relations of both animals and plants.

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*Meteorology for July:* The total precipitation at the Garden for the month was 3.68 inches. The maximum temperatures recorded for each week were 90° on the 10th, *91° on the 13th* and *on the 24th*, and 90° on the 31st. The minimum temperatures were 56° on the 6th, 54° on the 17th, *51° on the 26th*, and 54° on the 27th.

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## 1. Benefactors

The contribution of $25,000.00 or more to the funds of the Garden by gift or by bequest entitles the contributor to be a benefactor of the Garden.

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The contribution of $5000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a patron of the Garden.

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1. Tickets to all lectures given under the auspices of the Board of Managers.
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3. A copy of all handbooks published by the Garden.
4. A copy of all annual reports and Bulletins.
5. A copy of the monthly Journal.
6. Privileges of the Board Room.

## 7. Life Members

Annual members may become Life Members by the payment of a fee of $250.00.

## Information

Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

## Form of Bequest

I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

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# JOURNAL

OF

# The New York Botanical Garden

EDITOR

H. A. GLEASON

*Assistant Director*

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JOURNAL

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## NOTES ON THE HISTORY OF THE BEARDED IRIS

There has been no comprehensive authoritative work published on this interesting subject, and it will be part of the duties of the American Iris Society to collect information about Iris growing and Iris breeding from various people and to assemble it into a complete history. In the meantime, however, some preliminary notes of what we have already discovered may not be out of place.

Bearded Irises are native to Central and Southern Europe and Asia Minor, extending from the Alps through Italy, Hungary, Bulgaria, Palestine and Mesopotamia. Wild forms as generally known are the dwarf species of Iris of the Alps, represented best by *pumila*. The forms of *germanica* which are mostly native to Asia Minor, the blue *pallida* of Italy and Asia Minor as represented in many forms, the wild *variegata* of Hungary and Austria, and the wild forms from Asia Minor, such as *trojana*, *Ricardi*, *cypriana* and *mesopotamica*. It is not known when these varieties were first cultivated by man, but it is known that one of them, *albicans*, was carried all over southern Europe as far west as Spain by the Mohammedans, who planted them on the graves of their soldiers. It is not known when they began to do this, but it is known that they were driven out of Spain before 750 A.D. We have no knowledge of any Iris growing between that time and 1790, when in European catalogues about a half dozen or a dozen wild forms were offered. It is evident that between 1800 and 1850 the growing of Iris in gardens began in earnest, and that several breeders, among them Lemoin, Jacques, and Salter, began their work and produced quite a number of

new forms of Iris as of many colors. These Irises were all the progeny of two species, *pallida* and *variegata*, and they combined colors which today are known in the six sections, *pallida*, *variegata*, *amoena*, *neglecta*, *plicata*, and *squalens*. These six groups were until recently considered all species, but it has now been proven that they are all the result of *pallida* and *variegata;* but it is not known whether these early breeders worked with the pure strain of *pallida* and *variegata*, or whether they found wild self-hybridized Intermediate types between them and used these for their breeding. We have at present no record of just what these three men did, and the first record we do have of any named varieties of Iris is in 1855 when half a dozen or more varieties were offered under name by the nurseryman Dauvesse, of Orleans, France. Most of the varieties which he offered have since disappeared from the garden, but among them was the well-known variety Mme. Chereau.

Following 1855 we have again a lapse of twelve years about which we know nothing, until in 1867 Louis Van Houtte, of Ghent, Belgium, offered in his catalogue almost 100 named varieties, which we presume to have been the work of the three men mentioned and of Louis Van Houtte himself. For the next fifteen years Van Houtte remained the greatest introducer of Iris, introducing several hundred varieties of which only a few dozen are still known. His work was followed by the work of French breeders, of which we have no record at present, culminating in Verdier; and by Dutch breeders such as Krelage, Roozen, Leeuwen and others, and in England by Peter Barr, better known as a Daffodil expert. The varieties of Belgium and Holland were sent to France, and were by the French sometimes sold to England in mixtures, at auction, and it is through such a state of affairs that many varieties originating on the Continent and named there, were on their arrival in England renamed with English names, so that we cannot tell for certain to-day whether the many varieties bearing English names are all of them of English origin.

Peter Barr was one of the first to import varieties of Iris from the Continent and to give them English names, but he also

named many of his own seedlings. We have at the present time no exact records to show which are which. But such varieties as Albert Victor, Celeste, Lady Jane, Albatross, Cottage Maid, Perfection, Dr. Bernice, and others, are supposed to represent the Barr seedlings, and it is this collection of Iris, imported in 1905 by the American pioneer Mr. Bertrand H. Farr, of Wyomissing, which really laid the foundation for the present American interest in Iris. This collection and all others reaching America before 1905 represented only the hybrids of two species, *pallida* and *variegata*.

Iris breeders, however, were not long content to work with these species only. Sir Michael Foster, to whom the English refer as the "Father of Iris," began in the 80's to collect Iris species and Iris forms from all parts of the world, and to use them for breeding. His most sensational work was undoubtedly the crossing of the Bearded Iris with the *oncocyclus*, a race difficult to grow in England and almost impossible to grow in the eastern portion of the United States. The resulting crosses are valuable because they flourish in England and can be grown here with more or less success. Some of them are exquisitely beautiful in their deep copper tones and delicate tracings, which they have inherited from the *Oncocyclus* parent and which are not to be seen in the Bearded Iris proper. Among the best of these varieties are Dilkush, Parvar, and Shirin. From a gardener's point of view, however, Sir Michael Foster's greatest work was the introduction of the species *cypriana* for use in hybridizing. Coming from the dry climate of Asia Minor, this species is of a taller growth and larger flower than *pallida*, and, instead of having the stiff stems characteristic of the *pallida* varieties, its flowers are borne away from the main stem on graceful bending stalks. The five varieties of Sir Michael Foster which show these characteristics are Caterina, Crusader, Lady Foster, Shelford Chieftain and a few others, all of which have lately been offered in this country. They are all of them very beautiful, but unfortunately they seem to have inherited from their parent *cypriana* a delicacy of constitution which renders them rather susceptible to rot in our wet seasons, and it is evident that we must use them for breeding

rather than as permanent garden plants, for in our Northern gardens extreme vigor is the most important quality. Sir Michael Foster also used the species *kashmiriana*, and from it believed that he had given us two varieties, Kashmir White and Miss Willmott, really white triumphs. In this country, however, these also are a little "finicky as to their likes and dislikes, and it is interesting to know that recently their parentage has been questioned by other breeders, who believe they are not descended from *kashmiriana* at all, but from *cypriana*. It seems curious that a man of Sir Michael Foster's standing should have made such a mistake, and the question opens up a larger question as to the status of some of the collected forms which he used in his breeding.

Inspired by Sir Michael Foster's work, Caparne on the Island of Guernsey began in the 80's or 90's to force into bloom some of the later-blooming strains of Iris and to cross them with the early flowered dwarf species from the Alps. The result was a new race intermediate in bloom and intermediate in height between the two most valuable in our gardens, and which comes into bloom in Philadelphia usually about the middle of May, lasting for several weeks. Caparne is dead, and the details of his work are hard to trace, but we know that before 1902 he offered nearly a hundred of these Intermediates, most of which have disappeared from cultivation, but among them are the varieties Diamond, Dauphin, Dolphin, Ivorine, King Christian, and Royal which have reached this country within the last five years or so and can still be found only in a few catalogues. An interesting fact to note here is that Caparne sold a large collection of these Intermediates probably about 1900, or later, to Goos & Koeneman, of Niederwallaf, Germany, and that about 1910 this firm sent to America a set of Intermediates, including Fritjof, Halfdan, Helge, Ingeborg, and Walhalla, which were introduced here by Dreer and by Farr, and have become very popular. Whether these are actual Caparne varieties renamed, or seedlings of them, is not known, but anyone who grows the two sets side by side will be struck by the fact that they are in their characteristics as like as two peas in a pod. I do not wish

to say that Goos & Koeneman sent these out with any intention of deceiving, for it was their full right to buy unnamed seedlings from Caparne and to name them, but the fact remains that in America they are given the credit of introducing an Intermediate race, a credit which rightfully belongs to Caparne. While speaking of Goos & Koeneman I may mention that they have given us a set of late-blooming Iris for which they are deservedly famous, among these being such varieties as Iris King, Rhein Nixe, Gagus, Fro, and Loreley.

The only other breeders of note in this early period of which we have record at present are Verdier, in France, whose earlier varieties seem entirely lost to commerce, or at least are not known in America, but who is known for the varieties which were introduced after his death by the firm Vilmorin-Andrieux. Among these later varieties are Mercedes, Prosper Laugier, and LaNeige. Reuthe working in England between 1885 and 1900 introduced a dozen or fifteen varieties, practically all of which are now superseded except Mrs. Neubronner.

We come now to what may be known as the modern breeders, all of whom owe their inspiration to Sir Michael Foster, and who have followed his footsteps. In France the Vilmorins have since 1900 given us increasingly good varieties, beginning with Tamerlan and Oriflamme. They have in their breeding constantly used Amas, and of later years also *trojana*, with the result that their varieties are known for their very large flowers. Unfortunately with this size some of them have inherited somewhat of a sparseness of bloom, but in all plants this tends to be the rule, and perhaps may be overcome by future breeders. Among the smaller varieties introduced are Eldorado, Archeveque, Ambigu, Dejazet and Opera, all of which are very rich in their coloring and which are only small in comparison to such giants as Alcazar and the new Ambassadeur and Magnifica which have been introduced this year. This breeding work was begun by Phillippe de Vilmorin in the late 90's and has been, carried on of recent years by S. Mottet. In their trial gardens thousands of seedlings are being tested yearly. The Vilmorin Nurseries are not far from Paris, and near them is located the

firm of Cayeux & LeClerc, which, like Reuthe, have sent out a number of varieties which are now almost entirely forgotten but among which Petit Vitry and Mme. Blanche Pion stand out prominently and will continue to be admired for many years. Near Paris also is the firm of Millet et Fils, where Iris breeding has been going on for some 20 years or more, and with a definite ideal in view, namely, freedom of bloom. In their fields it is quite noticeable that their varieties contain many more flowers to the plant than the varieties of most breeders, and in contrast to some of the sparser blooming giants of the Vilmorins this freedom of bloom is particularly noticeable. Millet has raised but one exceptionally large Iris, Souv. de Mme. Gaudichau, a very rich deep-purple for which he will certainly become as famous in this country as he is now in Europe. His other varieties are not small, the best of them being Corrida, Bianca, Ivanhoe, Atlas, Romeo and Colonel Candelot. These have been introduced within the last ten years and are quite well known in Europe, but apparently not in this country. At the south of France is an amateur breeder who has done a great work in raising Irises for his climate. M. F. Denis lives near the town of Cette on the Mediterranean, and he found over 30 years ago that the standard Irises of that day did not give as large flowers in his climate as he desired. Inspired probably by Sir Michael Foster to search for an Iris to use as a parent from which to get size he finally chose *Iris Ricardi* from Palestine. This close relative of *cypriana* and *mesopotamica* stands 4 feet in height with very large flowers of a poor form and color; but M. Denis has been able to combine its size with the good form and the coloring of the standard varieties, and for his climate he has produced what might almost be called miraculous results, for his varieties are twice as big as the standard varieties. It is unfortunate, however, that this *Ricardi* parentage brings with it a trace of tenderness or lack of vigor, so that some of these varieties do not flourish well at the North. A few of them in fact are absolute failures even in Paris where the attempt to grow Mme. Claude Monnet has been given up by the nurserymen there, as the plants weaken and die. Other varieties of his, however,

which apparently haye as much *Ricardi* parentage, flourish in Paris and in England, and appear to do well in this country, among them being Dalila and Mme. de Sevigne. It is evident, therefore, that no general rule can be drawn about hybrids of this species, but that they must be tested one by one, and in this lies the hope that we can bring to this country some of his most beautiful achievements and that if they do not succeed we can at least breed from them to get further seedlings, retaining their good points without their tenderness. Most of his varieties are as yet not in the trade, although some of them have been grown by him for nearly twenty years, and they run largely to smoky blended colors which are not as a rule good for garden effect, although very beautiful singly at twilight.

In England the seedlings of Yeld have lately taken on considerable importance, and they have been very much admired in this country. The characteristic of all his seedlings is their extreme vigor, which is much welcomed by the gardener who has struggled with some of Sir Michael Foster's seedlings or some of the Denis *Ricardi* seedlings. Lord of June is one of the most beautiful of all Iris and of very large size, and Neptune and Halo and one or two others approach it closely. In yellows is Dawn, which is a variety which will be valuable for years to come. Sir Arthur Hort, near London, has for some years been trying to improve on Sir Michael Foster's seedlings in their size, and his seedlings of Caterina are glorious to behold, several of them being as big as Vilmorin's Magnifica. As they grow in England, these are apparently vigorous and free blooming, but the few plants that have reached this country have not yet been a success. His varieties and those of Yeld and Mr. Bliss, of whom I shall speak next, have all been introduced to the trade by R. W. Wallace of Colchester, who himself is also growing a number of seedlings of great promise.

The greatest English breeder of modern times is Mr. A. J. Bliss of Morwellham, Tavistock, Devon. He has been breeding Iris for 20 years, first for the scientific purpose of determining the parentage of our existing garden varieties, with results which have corroborated the belief of Mr. W. R. Dykes that but

two species, *pallida* and *variegata*, were responsible for all varieties in cultivation before 1890 or 1900. During the past ten years, however, Mr. Bliss has been endeavoring to produce new and beautiful varieties. He has been more successful than any other breeder in giving us varieties combining height, size, freedom of bloom and vigor of plant in practically all colors, and unlike other breeders he has not stuck to one ideal and produced merely one type of flower, but has produced all the types of Iris flowers. Of the 10,000 seedlings he has raised about 70 have been retained for further testing, and with these a dozen or twenty have been introduced to the trade in England, and a few are now appearing in this country. It will take further testimony to prove which are his best varieties, but Dominion has won a place for itself in England which no other Iris has ever reached, and he has other equally sensational seedlings with apparently the same parentage. This parentage, by the way, it is interesting to note must have something in common with of the Vilmorins' Ambassadeur and with Mr. Williamson's Lent A. Williamson, because these three varieties, produced in three different countries almost simultaneously, have very much in common in their growth, form, substance and texture, although different in color. The other varieties of Mr. Bliss which have already been introduced in England are not this same sensational character, but they are all distinct advances on existing varieties, and will in time, I am sure, displace many of our best sorts. Among them are Sweet Lavender, Cretonne, Camelot, Ben Bow, Tom Tit, Knysna, and Syphax, all of which are distinct advances in their respective types. We may expect much of Mr. Bliss' work in the near future, for he has passed the first stage of experimenting, has proved or disproved certain theories of genetics in regard to Irises, and is now advancing with considerable certainty toward definite goals.

All of the Irises of European breeders noted above have been successful in their native countries, but it is always a question as to how well they do will when transplanted to America, and therefore it is necessary that they should be tested here rather than taken on faith on their European performances. We have

fortunately in this country a large number of persons who are breeding Irises systematically, and from them we can expect a great deal as they are working in the different climates of this country where their varieties will be used in gardens. The pioneer of all breeding work, as of other Iris work in America, is Bertrand H. Farr. It was the collection which he introduced from the Barrs about 1905 which gave the first impetus to Iris growing in America, and in 1909 he introduced a set of seedlings for which he at once became deservedly famous. He has continued year by year to give us seedlings—occasionally very good ones, and often not so good,—among which stand out Quaker Lady, Montezuma, Juniata, Mary Garden and half a dozen more, will be grown in American gardens for many years to come.

The most scientific work of breeding Iris in this country has been done by Miss Grace Sturtevant, Wellesly Farms, Massachusetts. She has not worked on a large collection of Iris as has Mr. Farr, but, on the other hand, she has had in her small collection nothing but the very finest, and the seedlings which she has given us during the last few years are of wonderfully high quality. Like the seedlings of Bliss, they combine size and freedom, and moreover, almost without exception they are very vigorous in this climate. From the great number which she has introduced during the last few years it is hard to choose the best, but it seems certain that Afterglow, B. Y. Morrison, Queen Caterina, Reverie, and Shekinah will survive for many many years to come, and will bring her increasing fame as they become known over this country and Europe.

The only other large producer of American seedlings is Mr. W. E. Fryer, of Mantorville, Minnesota, who has produced a race of seedlings which he says in his climate are superior to any of the European varieties which he has tried. As seen in the East, unfortunately these varieties have not created a very good impression, it being the consensus of opinion that they are much too close to existing sorts, and in most cases not superior to them; and therefore it would not appear that most of them and therefore it would not appear that most of the are worth

cultivating in the climate of the Eastern United States or Europe; but it may be that in the cold Central and Northern States they will succeed better than varieties which have been raised in milder climates. The seedlings are still too new for these points to be settled, and we must wait for further evidence, but on their showing so far in the East, those gardeners who have known the best European Irises have felt certain in their own minds that Mr. Fryer had not seen the best of the modern European varieties when he named so many of his seedlings.

It would not be right to finish this short sketch without mentioning that there are at least a dozen amateur or semi-amateur Iris breeders who are just becoming known in this country. Most of them have not introduced many Irises into the trade as yet, but from these breeders I feel certain that we shall in a few years hear much, as they are beginning to produce varieties of real merit. Mr. Williamson ranks first among these, for his one variety, Lent A. Williamson, is all that is necessary to make his fame secure for many years; and we can only hope that he will give us others of equal merit. Mr. J. M. Shull and B. Y. Morrison, of Washington; Mr. E. M. Andrews, of Boulder, Colorado; Mr. William Mohr, of Mt. Eden, California; Mrs. C. S. McKinney, of Madison, New Jersey, A. P. Saunders, Mrs. Cleveland and many others, are producing seedlings that in a few years are certain to be of importance, and we can only wait with impatience until it is possible for us to secure these and try them in our gardens.

A brief sketch such as this can merely call attention to the three points; first, the very small knowledge we have of the early breeders, which knowledge we hope may shortly be increased by the research of our European friends; second, the little knowledge of Iris genetics which most of these breeders up to the present day have had to help them in their work; and thirdly, the fact that to-day the Iris breeder has more such knowledge at hand than any previous breeders, and not only that, but he has a better race of varieties to work from, which two new features should make it possible for the breeders of the present and future to give us distinct and unheard of advances

during the next ten or twenty years. From what I have seen and heard I feel convinced that we are just on the threshold of very great improvement of this beautiful flower.

JOHN C. WISTER.

## BOTANIZING AT BLACKSBURG, VIRGINIA

During a vacation period of two weeks spent at Blacksburg, Virginia, during the latter half of July, 1920, the writer made daily botanical excursions into the surrounding fields and woodlands and secured much information of importance, as well as a considerable number of specimens for the Garden herbarium. On account of the unusually rainy weather, fleshy fungi were abundant and claimed a large share of his attention. A list of the fungi found will be published in *Mycologia* for November.

The first find of particular interest was *Daedalea juniperina*, growing on a red cedar stump near Kanode's Mill, three miles west of Blacksburg. This very rare species had been previously found on red cedar in Kansas, Missouri, Kentucky, and South Carolina. *Tremella sparassoidea*, recently figured by Overholts in *Mycologia*, was collected beneath a white oak tree in Preston's Woods, one mile west of Blacksburg, on July 21; while on the same excursion it was discovered that the beautiful yellow bolete, *Ceriomyces retipes*, is much too bitter to be used for food, although *C. griseus*, a very near relative, is always nutty and sweet.

*Hexagona alveolaris* was found in abundance in Broce's Woods on fallen branches of hickory, which it had doubtless killed. This fungus may have to be reckoned with in growing walnuts, hickories, and pecans on a commercial scale. Another parasitic polypore abundant in the same grove was *Elfvingia lobata*, a large bracket-fungus attacking especially the white oak, but found also on hickory, red maple, etc. Its nearest relative, *Elfvingia megaloma*, so common in the North, is very rare at Blacksburg. *Hydnum erinaceum* was found in a decayed spot on the trunk of a living hickory.

Interesting observations were made on the food of the common box tortoise, which is abundant in that locality. As long as

*Vaginata vaginata*, a common mushroom growing on the ground in woods, was plentiful, the tortoise seemed to eat nothing else. *Russula virescens* was his second choice. Squirrels carried mushrooms to stumps and trees, but the tortoise devoured them in place, stem and all, leaving characteristic "chips" as proof of his presence.

A man came to me July 25 and asked me to look at a "gum tree with acorns on it." It proved to be the shingle oak, *Quercus imbricaria*, the only specimen I know in the vicinity of Blacksburg.

On July 27, I went to Brush Mountain and found the flora on the subcarboniferous shales and sandstones quite different from that on the Trenton limestone nearer Blacksburg. Several interesting fungi were added to my list. By the roadside near the foot of the mountain, a large patch of *Centaurea maculata* was found growing. This attractive weed has been introduced from Europe into many parts of the eastern United States.

Another exceedingly attractive introduction found in low clay soil along roads was the Venetian mallow, or flower-of-an-hour, *Hibiscus Trionum*, which can be highly recommended for use in design because of its decorative foliage, flowers, and pods. The blossoms are five-parted, creamy-white with purple center, orange stamens, and scarlet stigma.

Poison ivy was found commonly, as elsewhere, but a very stubborn case of poisoning was observed in which none of the ordinary remedies, like baking soda for example, seemed to give any relief. Potassium permanganate was also tried without a cure, but it was discovered that this treatment was being improperly applied. When the crystals were diluted with 2,800 parts of water and the solution prepared fresh every twelve hours, the sores that were bathed in the liquid disappeared in a few days.

In connection with the subject of poisons, I might mention an experiment I tried with flies on fresh specimens of *Venenarius cothurnatus*, a mushroom similar in its poisonous properties to the fly agaric. Some one has stated that flies are often only stupefied for a time by sucking certain mushroom juices and

that they afterwards come to life and fly away. By various experiments I determined that flies killed by this particular mushroom remained dead under observation for at least 24 hours, which must be a considerable length of time for a fly, and were found dead in the packets with the fungi a month later.

During the last week in July, I attended several meetings of delegates from various state corn and canning clubs, in session at the Virginia Polytechnic Institute, and was very agreeably surprised at the interest displayed by the youngsters in farming. There were 110 boys and 48 girls in attendance, in addition to a hundred or more from the immediate vicinity.

W. A. MURRILL

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## NOTES, NEWS AND COMMENT

The following visiting botanists have registered in the library during the summer: Professor H. D. House, Albany, N. Y., Mr. P. L. Ricker, Mr. G. F. Gravatt, Dr. J. N. Rose, Dr. B. O. Dodge, Mr. C. L. Shear, Mr. F. C. Meier, Mr. C. V. Piper and Mr. Walter Swingle, Washington, D. C., Professors Melvin R. Gilmore and Norma E. Pfeiffer, North Dakota, Professors L. H. Bailey, H. M. Fitzpatrick and Mr. H. E. Stork, Ithaca, N. Y., Mr. L. J. Pessin, Baltimore, Md., Professors John W. Harshberger and class and Dr. John Y. Pennypacker, University of Pennsylvania, Professors A. A. Tyler, Decatur, Ill., H. S. Jackson, Lafayette, Ind., Charles J. Chamberlin, Chicago, Ill., Alexander W. Evans, New Haven, Conn., Ira D. Cardiff, Yakima, Wash., and M. Akemine, Sapporo, Japan, Mr. Arthur F. Fischer, Manila, Philippine Is., Mr. Joseph T. Rock, Honolulu, Hawaii, Señor L. Rodriguez, Paris, France and Professor F. S. Earle, Cuba.

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Dr. W. A. Murrill represented the Garden at the second field meeting of plant pathologists held in the Shenandoah Valley and northward, August 2–7, for the study of fruit diseases, which was attended by from 75 to 100 experts on plant diseases from various countries. A general account of this important

meeting will appear in a future number of the JOURNAL, and a more technical paper will be prepared for the January number of *Mycologia*.

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Dr. Murrill addressed the members of the Garden Club of Suffern, New York, August 24, on "Edible and Poisonous Fungi." The railway journey was brightened by a wonderful display of the swamp rose mallow in the marshes north of Jersey City. This large and very showy plant flowers in this latitude in August and September, and may be seen in abundance in the coastal marshes from Massachusetts to Florida. Plants of the crimson-eye rose mallow, often scattered among the others, may be readily distinguished by their white flowers, with crimson center, and their long-pointed fruit-pods.

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Duplicate specimens of marine algae to the number of 3,406, chiefly West Indian and more particularly Bahamian, were distributed during the month of June. They were made up in twenty-one sets and were sent to various institutions in the United States and Europe, especially to those in which studies of the marine algae are being carried on and with which exchange relations have been established.

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Much progress was made throughout the summer in the preparation of the site in the Horticultural Garden for the new Iris Garden, and planting of several hundred kinds of Iris to be contributed by the American Iris Society was commenced in August. The work included path-construction and grading and was accomplished by the aid of the Special Development Fund contributed by members of the Garden. Paths connecting the new Iris Garden with those of the Herbaceous Garden to the north have been built as well as one leading to the Rose Mallow collection to the south. The path overlooking the Rose Garden from the west and south partly built last autumn was completed in May and affords fine views of this plantation, most attractive in June during the period of maximum bloom.

Mr. Kunihiko Okura, president of the Okura Paper Company, of Tokio, Japan, recently presented the museum with a number of articles made of "Papier-Silk." The Papier-Silk is a substitute for real silk. The material is made by using natural silk for warp and silk paper yarn for woof. The silk paper yarn is obtained from a native Japanese plant known as *Edgeworthia papyrifera* which is now extensively cultivated on the mountain slopes of Japan and used for paper pulp and yarn. In making the yarn the fiber is first made into a very thin paper. This is cut into ribbons of different widths and then by machinery spun into yarn. Cloth made from this material has a very fine texture and was formerly worn only by noblemen of high rank in Japan. It is only recently that an attempt has been made to commercialize and popularize the industry.

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Dr. Jonathan Dwight contributes the following interesting note on the Linnaean Botanical Garden, at Upsala, Sweden: In the lower end of Svartbacksgatan at Upsala is the old botanical garden of Carl von Linné which has been nearly abandoned for about a century. This was the spot where the Flower-King spent most of his time among the plants, etc., where the grass throve and trees grew tall. The Egyptian Antiquities from the Victorian Museum have reposed there for some time in part in his hothouse and part in the Museum for Northern Antiquities. A change has of late taken place in the old garden. Some of the old trees have been cut down, the well cultivated lawns are elevated, and Linné's lily ponds (which are seen in old copper-plate engravings of his "Hortus Upsaliensis") have been rebuilt in their location. The young men of the old Linnean Society have accomplished this change and renovation. Linné's greenhouse and the foreground have as yet not been restored. This fall, however, the Museum of Northern Antiquities will be moved to "Gustavianum" and then the house will be arranged for a Linnean Museum. Professor Svedelius informs the public that a large donation has been received by the Linnean Society for a new home for the Director. As soon as it is ready the

Linnean Society will take possession, and also of the Linné House, where the expensive collections of furniture, books, bric-a-brac, etc., which were the belongings of Linné will then be moved. The greater portion of these have been heretofore kept in the Linné house in Svartbacksgatan.

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*Meteorology for August.* The total precipitation for the month was 7.49 inches. The maximum temperatures recorded at the Garden for each week were *91° on the 8th*, 89° on the 12th *91° on the 17th*, 84° on the 27th and 87° on the 30th. The minimum temperatures were *55° on the 3d*, 65° on the 12th, *55° on the 20th* and 56° on the 28th.

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## ACCESSIONS

### MUSEUMS AND HERBARIUM

484 species of flowering plants from Oregon. (Collected by Professor M. E. Peck.)

2 specimen of *Vaccinium crassifolum* from North Carolina. (Given by Mrs. H. A. J. Wilkins.)

161 species of flowering plants from Jamaica, West Indies. (By exchange with the Royal Gardens, Kew, England.)

8 colored lantern slides of dahlias. (Prepared by Miss Fleda Griffith.)

315 specimens of flowering plants from Indiana and neighboring states. (By exchange with Mr. C. C. Deam.)

45 photographs of cacti. (By exchange with the United States National Museum.)

2 uncolored lantern slides of dahlias. (Prepared by Mr. Carl Riedlbauer.)

6000 specimens of flowerless and flowering plants from Trinidad, West Indies. (Collected by Dr. and Mrs. N. L. Britton, Miss Dorothy Coker, and Dr. T. E. Hazen.)

18 specimens of *Penstemon* from Colorado. (Given by Professor Ellsworth Bethel.)

1 specimen of *Synthyris* from Alaska. (By exchange with the United States National Museum.)

1 specimen of *Panax* from Pennsylvania. (Given by Mr. William Trimble.)

1 specimen of *Penstemon* from Oregon. (Given by Mr. J. C. Nelson.)

3 specimens of *Syntheris* from Colorado. (Given by Professor Ellsworth Bethel.)

1 specimen of *Penstemon australis* from South Carolina. (By exchange with Dr. C. A. Ludwig.)

2 colored lantern slides of *Kalmia latifolia*. (Given by Mrs. N. L. Britton).

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Vol. 3, part 1, 1910. Nectriaceae—Fimetariaceae.

Vol. 7, part 1, 1906; part 2, 1907; part 3, 1912. Ustilaginaceae—Aecidiaceae (pars) (Parts 1 and 2 no longer sold separately.)

Vol. 9 (now complete), parts 1–7, 1907–1916. Polyporaceae—Agaricaceae (pars). (Parts 1–3 no longer sold separately.)

Vol. 10, part 1, 1914; parts 2 and 3, 1917. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916; part 2, 1917; part 3, 1918. Chenopodiaceae—Allioniaceae

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913; part 6, 1918. Podostemonaceae—Rosaceae.

Vol. 24, part 1, 1919; part 2, 1920. Fabaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 32, part 1, 1918. Rubiaceae (pars).

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

**Memoirs of the New York Botanical Garden.** Price to members of the Garden, $1.50 per volume. To others, $3.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

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Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. viii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 pp., with 73 figures and 14 plates. 1908.

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Vol. VI. Papers presented at the Celebration of the Twentieth Anniversary of the New York Botanical Garden. viii + 592 pp., with 43 plates and many text figures. 1916.

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**NEW YORK BOTANICAL GARDEN**

**Bronx Park, New York City**

Vol. XXI November, 1920 No. 251

# JOURNAL

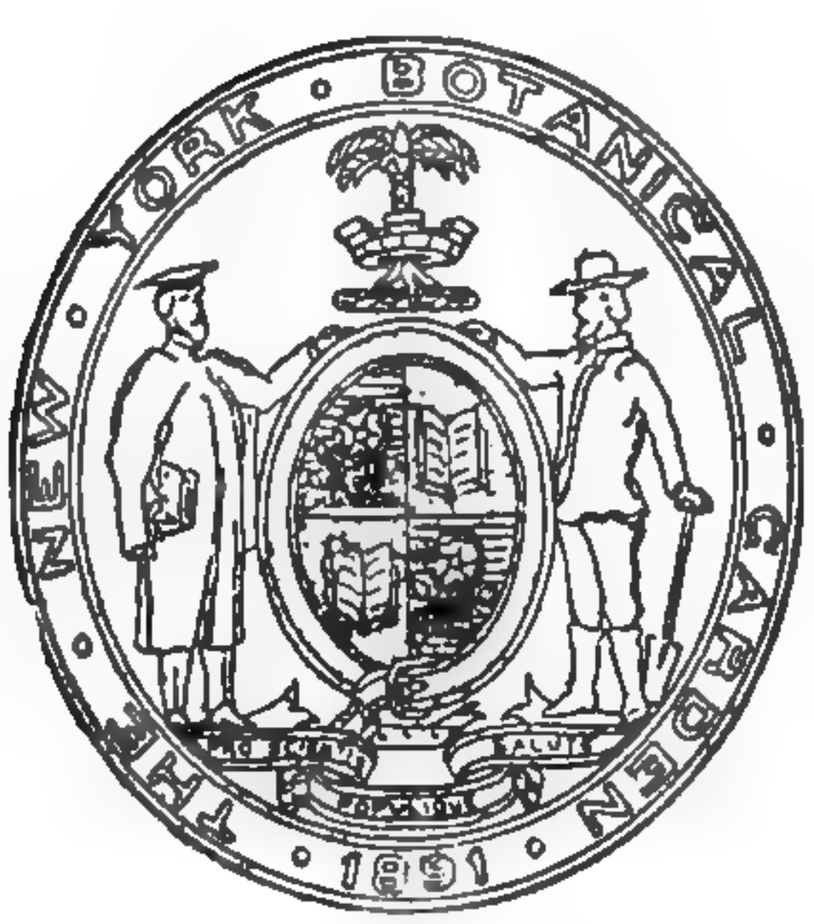
OF

# The New York Botanical Garden

EDITOR

H. A. GLEASON

*Assistant Director*

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JOURNAL

OF

The New York Botanical Garden

VOL. XXI November, 1920 No. 251

# REPORT BY THE DIRECTOR-IN-CHIEF UPON A VISIT TO BOTANICAL INSTITUTIONS IN ENGLAND

TO THE SCIENTIFIC DIRECTORS OF THE NEW YORK BOTANICAL GARDEN.

*Gentlemen:* By permission of the Board of Managers, I was absent from New York during the period August 7 to October 12, 1920, engaged in botanical studies in England, accompanied by Mrs. Britton. Nine years had elapsed since our last visit to Europe, and many problems had arisen in the course of our work in development, installation and investigation which an examination of the older English botanical establishments, and studies of their collections could not fail to be helpful in solving; we have brought home with us notes and impressions which will be useful in many ways and have arranged for exchanges of duplicate plants and specimens of value to our collections.

Most of our time was, naturally, spent at the Royal Botanic Gardens at Kew, still the most important botanical institution in the world; it was a very great pleasure to learn, at first hand, that the exigencies of war had not been permitted to effect deterioration of this great treasure-house of information concerning plants so vitally important to civilization. Sir David Prain, Director, was in Scotland on vacation during the first part of our visit, but returned before we came away; we were cordially welcomed by Captain Arthur W. Hill, Assistant Direc-

tor, and by others of the staff. We found all parts of the establishment, grounds, plantations, greenhouse collections, museums, library and herbarium in excellent condition and all considerably developed. Our delight at returning was sadly marred by learning of the death, a few days before, of our very dear old friend, J. G. Baker, for many years Keeper of the Kew Herbarium and a distinguished contributor to botanical literature.

The summer had been wet and cold in England and the autumn continued cold and cloudy. Vegetation was luxuriantly green. Kew gave one the impression of a level velvety green carpet from which arise trees, shrubs, flower-gardens and buildings. Security of the plantations and labels and a high degree of order and neatness is effectively secured by the solid brick wall about ten feet high which surrounds the whole reservation of about 270 acres, broken by six entrances for pedestrians only, closed after sunset; admission charges are an innovation since our last visit, one penny on five days, six pence on two days of the week. Many trees had made notable growth since our last visit, and the arboretum had been enriched by rare species. We were especially interested to see the specimens of *Nothofagus*, relatives of Beeches, from extreme southern South America, growing vigorously and to learn that *Nothofagus obliqua* is one of the most rapid-growing of hardwood trees. They are of quite different aspect and have leaves different from those of any true Beech, but their fruits are similar to beechnuts; the trees might, perhaps, be hardy in some part of the southeastern United States. The Chinese Tulip-tree (*Liriodendron chinense*), of fascinating interest to us as a very close relative of our own *Liriodendron Tulipifera*, inhabiting the eastern United States, but smaller, had grown into trees some twenty feet high, their foliage almost indistinguishable from that of their American congener. I was fortunate in being at Kew for an afternoon with my friend, Dr. A. Henry of Dublin, whose profound knowedge of trees puts him in the highest rank of dendrologists, and he told me many things. He pointed out to me the great desirability of initiating experiments on a large scale in hybridizing forest trees in order to get the advantage of the more rapid

growth of selected hybrids than that of either parent, and suggested international coöperation, as he believed that better results from such experimentation could be obtained at some point in the southern United States than elsewhere; the topic interested me greatly, because the possibility of obtaining an increased yield of paper-pulp from hybrid poplars had already been brought to our attention at home.

The wealth of shrubbery at Kew, as elsewhere in southern England, makes one envious of the climatal conditions which render it possible; the evenly distributed rainfall, the cool summers and the mild winters provide a combination of conditions through which a great variety of shrubs from warm-temperate regions may be grown to perfection, and many of them are of great beauty and of high botanical interest. This season the roses were in elegant bloom during August and until late September; the installation of the Rose Collection at Kew, with plots alternating with clipped holly trees, a clipped holly hedge forming a semicircular background, is very striking. Mrs. Britton took notes on all the varieties in bloom during our visit, much aided by data kindly supplied by Mr. John Coutts, the foreman in charge. The Rhododendron and Azalea plantations at Kew have been greatly expanded in recent years, along both sides of a path several hundred feet in length, forming a wonderfully attractive mass of evergreen foliage in the autumn.

The herbaceous plantations shared the general luxuriance of the woody plants. The collection of *Kniphofias* (Red-hot Pokers) was of especial interest, many kinds being in maximum bloom in September, and were pronounced by Mr. J. Burtt-Davy, who is at Kew with Mrs. Burtt-Davy, occupied in writing a Flora of the Transvaal, to be more elegant than they are in the wild condition in South Africa. Hollyhocks, Snapdragons, Campanulas and Pentstemons were in perfection in large masses. The systematic herbaceous collections contained many plants we had never seen in bloom before, many of them from southern regions, none perhaps more beautiful than the Michaelmas Daisies (North American Asters), represented by numerous species, and the American Golden-rods. Of particular interest

to us were two of the wild species of *Dahlia*, reminding us of the great collection of Dahlias brought together by our Dr. Howe, now in full bloom at home.

The famous Kew rock-garden was as fascinating as ever, with its great number of species; it has been modified recently by the elimination of some trees and tall shrubs which were casting too much shade for the conditions of low sun and prevalent cloudy weather. Here, as in many other rock-gardens, species not naturally living among rocks are freely admitted in order to increase the variety of plants shown. It was quite unexpected for example to see the North American Turtleheads (*Chelone*), and our blue *Lobelia*, plants typical of wet woodlands and swamp-borders, growing among dry rocks at the top of a slope!

The collections under glass were as instructive as ever, and many species were here also seen by us for the first time. The *Danaea* ferns recently sent by Mr. W. G. Freeman from Trinidad are noteworthy accessions and reminded us of our study of them in the mountain forests of that island earlier in the year. Many of the Cycads and Palms had made notable growth during nine years and additional species had been brought in. Professor Charles J. Chamberlain, of the University of Chicago, spent some days at Kew in prosecution of his noteworthy Cycad studies, and we discussed this family in some detail; he had attended the meeting of the British Association for the Advancement of Science held this summer at Cardiff; we agreed that a new illustrated taxonomic monograph of the Cycadaceae is a great desideratum, the species of the tropical American genus *Zamia*, the West Indian and Floridian representatives of which we have brought into our New York collections in many good specimens, are still incompletely described, while those of continental America from Mexico to Peru are very imperfectly known. Everyone at all familiar with Palms knows that a modern monograph of the Palmaceae and their enormously important products would be a great boon to science and to economics; I had recently discussed this topic with Professor L. H. Bailey and with other experts; the Kew collections and

our own would form a basis for an investigation which might lead up to such a monograph, supplemented by field and garden studies in the American and Old World tropics, requiring several several years' work by trained investigators and collectors, comparable with the investigation of the Cactus Family by Dr. J. N. Rose and myself supported by the Carnegie Institution of Washington, the results of which are now in course of publication. Professor T. D. A. Cockerell of the University of Colorado and Mrs. Cockerell were studying at Kew and at the British Museum and we talked with them frequently on matters of mutual interest; he was engaged in classifying the collection of fossil insects at the Museum; Mrs. Cockerell was continuing studies in plant breeding.

I studied the Cactus Collections at Kew in considerable detail and obtained from them much information which will be of value in the completion of our investigation. A copy of the second volume of our monograph, published in Washington on September 9, reached me in time to consider it, as well as the first volume, with Mr. R. A. Rolfe, the member of the Kew staff who has the herbarium collection of cacti in charge, and we examined every specimen there; he rearranged the collection in accordance with the treatment of genera included in the two published volumes, after I had annotated the determinations of the species and named up the undetermined specimens, which were quite numerous. The Kew collection is very incomplete. I proposed that we prepare specimens from our great series of living plants and send them to Kew in exchange for other material, in order that a good representation of the species may be available there for study, and this proposition was cordially accepted by Sir David Prain. I also annotated determinations of names upon a large number of the living cacti, and we may advantageously supplement that collection by cuttings from ours. We are indebted to Mr. William Taylor, foreman in charge of the Kew Succulent House for aid and information, especially in examination of cacti of the genus *Rhipsalis*. We had the pleasure of meeting Professor R. Chodat of the University of Geneva, who had been attending the meeting of the British

Association for the Advancement of Science, and who had aided our studies of Cacti by specimens and notes obtained by him in Paraguay a few years ago.

The great orchid collections at Kew, living plants, herbarium specimens, paintings and sketches, is one of the most important assets of the establishment. Mr. Rolfe has been a diligent student of Orchidaceae for over thirty years and his knowledge of them is profound; he retires soon from the Kew staff in accordance with the age limit of 65 of the British Civil Service; he has a great desire, upon his retirement, to make a critical study of the orchid herbarium formed by the German student Reichenbach, which it will be remembered was, in accordance with his instructions, locked up and thus withdrawn from study for a period of twenty-five years after Reichenbach's death some thirty years ago, thus preventing all recent orchid students from knowing with certainty just what species the German had described in his voluminous writings. One can scarcely imagine a scientific man taking a course so despicably unscientific; it is important, however, that the collection be studied by orchidologists and it is now available in Vienna.

I am indebted to Mr. S. A. Skan, Librarian at Kew, for much bibliographic information; the collection of botanical books is wonderfully complete and in admirable order, but one has to learn the location of books upon the shelves in order to use the collection rapidly. Through expenditure of a portion of our Special Development Fund of 1920, subscribed by members, I was enabled to purchase from London booksellers a considerable number of rare volumes needed in our library, and Mr. Skan gave me valued advice as regards some of these purchases. Dr. Barnhart will make a detailed report upon these accessions. In this connection, the present is a favorable time for obtaining rare books at reasonable prices; the expenditure of several thousand dollars within the next year would be an excellent investment.

One of my principal objects in visiting English botanical institutions at this time was to obtain determinations of a large number of specimens from northern South America in our own

collections, by comparison with named specimens at Kew, at the British Museum of Natural History and in the herbarium of Linnaeus preserved at the rooms of the Linnaean Society of London; this errand was in connection with the investigation of the Flora of northern South America now being prosecuted by us in coöperation with the United States National Museum and the Gray Herbarium of Harvard University. For this purpose I selected and took with me in two large chests several hundred unnamed herbarium specimens, collected mainly by Dr. Rusby and Dr. Pennell in Colombia in 1917–1918, by Dr. Rose in Ecuador in 1918, by Mr. Pittier in Venezuela in 1918, and by ourselves in Trinidad early in 1920. I was fortunate in obtaining for this somewhat heavy piece of work, the nearly continuous aid of Mr. N. E. Brown, formerly of the Kew staff, now retired. We succeeded in making nearly all the comparisons needed, but I left a few specimens with Mr. Brown for further investigation. The results of our studies showed us conclusively that many species new to science are included in the collections already made; the English collections from these regions are large, but incompletely worked up, so that while in many cases we were able to match specimens we were unable to find published names for them. Some further determinative comparisons may, doubtless, be made at the herbarium of the Jardin des Plantes in Paris, and by favor of Captain Hill, some specimens were transmitted to Professor Lecomte, Director of the Paris institution, with a request for comparisons to be made there and the results communicated to me at New York; the specimens sent were Scrophulariaceae, a family now under study by our Dr. Pennell. I also took notes upon the sedges of northern South America in the Kew collections as written up by the late Mr. C. B. Clarke, who studied them for many years, for future use in cataloging them; his monograph of this family remains unpublished. Mr. Brown showed us, at his home, the very complete collection of South African Mesembryanthemums which he has brought together after many years' effort, for illustration and descriptions; we arranged with him for obtaining a series of photographs of these wonderful plants.

Other members of the Kew staff aided me in various ways. Mr. T. A. Sprague, who made a trip into Colombia and Venezuela some years ago, helped with some determinations and I discussed botanical nomenclature with him in some detail, he being now occupied in the publication of the fifth Supplement to the invaluable "Index Kewensis" and we also appreciate aid and suggestion from Dr. Otto Stapf, Mr. C. H. Wright and Mr. John Hutchinson. We talked at some length with Miss M. Smith, botanical artist of Kew, relative to her long-continued work upon the illustrations for the *Botanical Magazine*: increased cost of publication has recently made necessary the issuing of fewer plates annually, as in the case of our *Addisonia*.

A call at Kew by Sir Daniel Morris gave us opportunity to meet him and to engage in pleasant reminiscences. It will be recalled by those familiar with the early years of development of the New York Botanical Garden, Doctor Morris, then Assistant Director at Kew, gave us much valued advice, and that he delivered one of the first of our public lectures, on "The Royal Botanic Gardens at Kew," at the American Museum of Natural History on the evening of December 17, 1895. During his subsequent long service as Commissioner of Agriculture for the British West Indies, he aided us frequently in various ways. After his retirement from active service some years ago he served as a member of several important boards and commissions and is still keenly interested in the horticulture of southern England. We learned with much interest of the progress of bibliographic work in the preparation of a new edition of the "Iconum Botanicarum Index" undertaken in 1913 by the Royal Horticultural Society in coöperation with Kew, the British Museum and other institutions, now approaching completion; the appearance of this reference catalogue of some 250,000 published illustrations of plants is eagerly anticipated.

We had a delightful evening with Dr. A. D. Cotton, formerly of the Kew staff, now mycologist of the Board of Agriculture, and Mrs. Cotton; we discussed the possibility of making the recently established journal *Botanical Abstracts*, published in the United States, a truly international record of current botanical

literature, to occupy the place of the *Botanisches Centralblatt*, now deceased, of which Dr. Cotton had been one of the editors. We also met Mr. J. S. Gamble, well known from his investigations of the flora of British India, who is occupied in the writing and publication of his "Flora of the Madras Presidency." Unexpected pleasures were experienced in escorting Professor F. S. Lee, of our own Board of Managers, with Mrs. Lee and their children through Kew on one afternoon and Mr. E. V. Z. Lane of our Corporation with Mrs. Lane on another.

Most of Mrs. Britton's time at Kew was devoted to studies of the Moss Collections with special reference to her work upon the West Indian species. Notes were taken upon all the Trinidad moss specimens preserved at Kew, for use in determining the large series collected by her in the forests of that island, and she was able to supply names and annotations for many others; Mr. A. N. Dixon made a short visit to Kew and consulted with Mrs. Britton about the West Indian and South American mosses and also arranged for an exchange of duplicate specimens.

At the British Museum of Natural History I made examinations and comparisons of many specimens, aided especially by Mr. William Fawcett, who is continuing there his studies on the flora of Jamaica, based largely upon specimens collected on that island by Mr. William Harris through our coöperation extending over several years with the Jamaica Department of Agriculture, and by myself and Mrs. Britton; the results of this investigation are appearing in a series of volumes written by Mr. Fawcett and Dr. A. B. Rendle, head of the British Museum Department of Botany, entitled "The Flora of Jamaica," published by the trustees of the British Museum; a copy of the third published volume of this valuable work had reached me just before I left New York. Messrs. Fawcett and Rendle desire that the volume to contain descriptions of the Ferns and their allies, the mosses, and the hepatics be written by Mr. Maxon of the United States National Museum, by Mrs. Britton, and by Professor Evans of Yale University respectively; Mrs. Britton accepted their invitation as regards the Mosses. Dr. Rendle kindly proffered aid in our South American studies and will

send us some duplicate specimens in exchange; he had already supplied us a few years ago with a valuable series of specimens collected by Hartweg in Ecuador and Colombia. Dr. H. F. Wernham and Mr. Edmund Baker of the Museum staff aided in comparing specimens, and I met Mr. Spencer Moore, who had supplied me with data concerning some Brazilian Cacti collected by him several years ago. I talked with Mr. James Britton, formerly of the Museum staff, now retired, relative to the publication of the *Journal of Botany*, of which he has been editor for many years; advanced costs of printing, unassociated with increased circulation, are seriously threatening the continuation of this periodical, founded in 1863.

We greatly enjoyed two days at Oxford under the guidance of Dr. G. Claridge Druce and Professor S. H. Vines. The ancient botanical garden of Oxford University, some 300 years old, and the first botanical garden established in England, is a Mecca for all students of plants; here we came in touch with the beginnings of botanical science and with the records and traditions of its progress in the enlightenment and civilization of mankind. To walk the paths traversed by Morison, Dillenius, Sherard, the Sibthorps and their distinguished successors is an inspiration always to be recalled, and the many rare old trees are fascinating. Seclusion for study and protection of the collections is here ensured by the enclosing high wall, and the ancient sculptured entrances are very impressive. The garden is open to visitors for some hours nearly every day. Dr. Druce showed us some of the ancient herbarium specimens collected in the United States by Mark Catesby and others, and we spent some time in naming the many undetermined ones. The mosses of the herbarium of Dillenius were of especial interest to Mrs. Britton; these are ample in quantity and perfectly preserved. Dr. Druce had spent some months in Trinidad a few years ago and there collected a large number of specimens, which had remained undetermined; I was able to name most of them, at his request. Professor Vines, who has recently retired from the Sherardian professorship, escorted us through portions of the University gardens and grounds, and we are also indebted

to him and to Mrs. Vines for charming hospitality; we talked about the history, progress and needs of botanical science.

A delightful visit was made to Cambridge as guests of Mr. John C. Willis and Mrs. Willis, and the University Botanical Garden there was studied with pleasure and profit under valued guidance by our hosts, by Mr. F. G. Preston, superintendent of the Garden, and by Miss Saunders of the School of Botany. This garden is the largest and most highly developed of all strictly University Gardens, containing a wealth of species, both hardy and under glass, many of them seen by us for the first time. I studied the noteworthy collection of Cacti with much interest and arranged for an exchange of some cuttings with Mr. Preston. Miss Saunders told us about some of her experimental work in plant breeding. We discussed with Mr. Willis many of the problems of geographical distribution and mutation of plants, to which he has given close attention in recent years from data drawn largely through his experience as director of the botanical garden at Peradeniya, Ceylon, and of the botanical garden at Rio de Janeiro, and also consulted with him relative to further field work in South America; he is at present the botanical advisor in Europe of the Brazilian government.

Circumstances provided opportunity for visits to the New Forest, which we reached by motor-car from Southampton, while awaiting our sailing for home, and we now understand the fascination this great reservation has for all nature-lovers. We are grateful to officers of the International Mercantile Marine Company for their care of the scientific specimens taken with us for study on the "Philadelphia" and brought back on the "New York," and for other favors.

The most important consideration concerning botanical science which has deeply impressed itself upon me after this interesting trip, is one which I already had some cognizance of. It is that the botanical institutions of the United States and their older, sister institutions of England are undermanned scientifically. The knowledge of plants has during the past two decades increased by leaps and bounds through exploration, experimentation and discovery; the collections of the institutions have

correspondingly increased, but the personnel of their staffs has not. For the organization of this vastly increased knowledge, the arrangement and classification of the immensely valuable collections and the presentation of results of investigation to the public, it is essential that provision for additional experts be made.

Respectfully submitted,

N. L. BRITTON,
*Director-in-Chief.*

## NOTES, NEWS AND COMMENT

Dr. Marshall A. Howe lectured on "Dahlias and their Culture" before the South Side Garden Club at West Islip, Long Island, on September 10, and on September 29 he acted as one of the judges at the annual dahlia show of the Short Hills Garden Club at Short Hills, New Jersey.

Members of the Nature Committee of the Good Citizenship League of Flushing, Long Island, spent October 18 at the Garden, especially to study autumn coloration. They were accompanied on their tour through the grounds by members of the Garden staff.

The Garden has recently received as a gift from Mr. Lee G. Day a collection of approximately 400 orchid plants, representing some 30 species. These were shipped directly from Brazil and reached the Garden in good condition, despite considerable delay in delivery. The collection was chosen largely for its decorative flowers and promises to be a valuable addition to the present display in conservatory range 2.

Dr. N. L. Britton and Dr. C. F. Millspaugh, of the Field Columbian Museum, published June 26 The Bahama Flora, an octavo volume of viii + 695 pages, describing or listing with

appropriate keys the known flora of the group of islands. The work is based on the long-continued explorations of the islands by the authors, assisted by members of the Garden staff and others. The chapters on the lower cryptogams were contributed by Mrs. N. L. Britton (mosses), Dr. Alexander W. Evans (liverworts), Dr. L. W. Riddle (lichens), Dr. M. A. Howe and the late Dr. F. S. Collins (algae), Mr. C. S. Boyer (diatoms), and Dr. F. J. Seaver and Dr. W. A. Murrill (fungi).

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*Meteorology for September.* The total precipitation for the month was 5.01 inches. The maximum temperatures recorded for each week were 80° on the 3d, 88° on the 12th, 83° on the 18th, *89° on the 24th.* The minimum temperatures were 50° on the 3d, 54° on the 9th, *19° on the 20th*, 49° on the 23d.

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The American Rose Society held a regular meeting at the Garden September 29. The members first assembled at the Mansion at 10:30 A.M. and at 10:45 visited the Rose Garden. After a luncheon in the tea-room of the Mansion, there was a business meeting in the adjoining lecture hall, followed by an interesting program. At 3 o'clock the visiting guests were taken on a tour of inspection through portions of the grounds and buildings, including the hemlock grove, the new iris garden, the herbaceous garden, conservatory range 1, the flower gardens in the vicinity, and the dahlia collection.

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Professor William B. Brierly, of the new Institute of Plant Pathology of Rothamsted, England, visited the Garden on October 8. He came over in July as a representative of the English Government to take part in the fruit-disease survey through the Shenandoah Valley and northward. Later, he made an extensive tour through the United States east of the Rockies, visiting the experiment stations and universities and getting acquainted with American botanists and American methods of research in phytopathology. On October 9, he sailed for England, taking with him the good wishes of everyone who met him.

Work is actively in progress on the construction of a stone entrance to the Horticultural Grounds from Southern Boulevard and a wall and fence along the east side of the same street. This is being accomplished through the bequest of the late Mrs. Mary J. Kingsland.

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The Cherry Garden Shelter House, the gift of Dr. N. L. Britton and Mrs. Britton in honor of the late Judge Charles P. Daly and Mrs. Daly, was opened October 28. A number of invited guests were present and Dr. R. A. Harper, chairman of the Scientific Directors, made an appropriate address as the memorial tablet was unveiled. A photograph of the shelter house will appear in a later issue of the JOURNAL.

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## ACCESSIONS

### LIBRARY ACCESSIONS FROM JUNE 1 TO OCT. 31.

BADGER, MRS. C. M. *Wild flowers drawn and colored from nature.* New York, 1859. (Given by Mrs. Fannie Griscom Parsons.)

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## MUSEUMS AND HERBARIUM

2 specimens of flowering plants from Virginia. (Collected by Dr. W. A. Murrill.)

6 specimens of mosses from Colorado and Alaska. (By exchange with the United States National Museum.)

1 specimen of moss from Washington. (By exchange with Professor T. C. Frye.)

30 specimens of mosses from Florida. (By exchange with Mr. Severin Rapp.)

1 specimen of moss from Texas. (By exchange with Professor S. W. Stanfield.)

100 specimens of mosses from Cuba. (By exchange with Brother Leon.)

27 specimens of mosses and hepatics from Cuba. (By exchange with Brother Hioram.)

1 specimen of *Hapalopilus gilvus* from Illinois. (By exchange with Dr. P. S. O'Gara.)

9 specimens of woody and fleshy fungi from southern Florida. (Collected by Dr. and Mrs. N. L. Britton.)

2 specimens of *Ganoderma nevadense* from California. (By exchange with Dr. A. S. Rhoads.)

1 specimen of *Merulius* from Georgia. (By exchange with Mr. B. B. Higgins.)

6 specimens of fungi from Colorado. (By exchange with Professor Ellsworth Bethel.)

2 specimens of cup fungi from California. (By exchange with Professor Ellsworth Bethel.)

38 specimens of Ascomycetes from various localities. (By exchange with Dr. W. H. Long.)

1 specimen of *Tylostoma mammosum* from Utah. (By exchange with Professor A. O. Garrett.)

8 specimens "Fungi Wisconsinenses Exsiccati." (Distributed by Dr. J. J. Davis.)

432 specimens "West American Fungi." (Distributed by Dr. David Griffiths.)

23 specimens of fungi from Washington. (By exchange with Mr. Geo. L. Zundel.)

1 specimen of *Xanthoporia Andersonii* from Maryland. (By exchange with Dr. Geo. C. Hedgcock.)

100 specimens "North American Uredinales" fascicle 22. (Distributed by Mr. Elam Bartholomew.)

94 miscellaneous specimens of flowering plants from Europe. (By exchange with the Royal Garden, Kew, England.)

75 specimens of lichens from Switzerland. (Distributed by Dr. C. Meresch-kwosky.)

157 specimens of orchids from South America. (By exchange with the Royal Garden, Kew, England.)

22 specimens of flowering plants from the mountains of North Carolina. (Given by Mr. Arthur Huger.)

69 specimens of lichens from western North America. (Given by Dr. Albert C. Herre.)

1 specimen of box-huckleberry from Pennsylvania. (Given by Mr. H. A. Ward.)

1 specimen of *Gemmingia chinensis* from Texas. (Given by Mr. D. A. Saunders.)

52 specimens of flowering plants from western North America. (By exchange with the United States National Museum.)

1 specimen of *Centaurea maculosa* from Virginia. (Given by Dr. W. A. Murrill.)

1 specimen of *Scleropoa rigida* from Oregon. (Given by Dr. J. C. Nelson.)

500 specimens of plants from New England. (Given by Mr. Charles F. Batchelder.)

2 specimens of *Radicula austriaca* from Wisconsin. (By exchange with Professor A. L. Stone.)

6 specimens of flowering plants from Florida. (Given by Mr. Severin Rapp.)

1 specimen of *Vaccinium crassifolium* from North Carolina. (Given by Mrs. Walter B. Devereux, Jr.)

1130 specimens of flowering plants from British Guiana. (Collected by Professor A. S. Hitchcock.)

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Mrs. F. F. Thompson.

# Provisions for Benefactors, Patrons, Fellows, Fellowship Members, Sustaining Members, Annual Members and Life Members

---

## 1. Benefactors

The contribution of $25,000.00 or more to the funds of the Garden by gift or by bequest entitles the contributor to be a benefactor of the Garden.

## 2. Patrons

The contribution of $5000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a patron of the Garden.

## 3. Fellows for Life

The contribution of $1000.00 or more to the funds of the Garden at any one time shall entitle the contributor to be a fellow for life of the Garden.

## 4. Fellowship Members

Fellowship members pay $100.00 or more annually and become fellows for life when their payments aggregate $1,000.00.

## 5. Sustaining Members

Sustaining members pay from $25.00 to $100.00 annually and become fellows for life when their payments aggregate $1,000.00.

## 6. Annual Members

Annual members pay an annual fee of $10.00.

All members are entitled to the following privileges:

1. Tickets to all lectures given under the auspices of the Board of Managers.
2. Invitations to all exhibitions given under the auspices of the Board of Managers.
3. A copy of all handbooks published by the Garden.
4. A copy of all annual reports and Bulletins.
5. A copy of the monthly Journal.
6. Privileges of the Board Room.

## 7. Life Members

Annual members may become Life Members by the payment of a fee of $250.00.

## Information

Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

## Form of Bequest

I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

Vol. XXI December, 1920 No. 252

# JOURNAL

OF

# The New York Botanical Garden

EDITOR

H. A. GLEASON

*Assistant Director*

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PUBLISHED FOR THE GARDEN

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THE PRESIDENT OF THE DEPARTMENT OF PUBLIC PARKS
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ARTHUR J. CORBETT, *Superintendent of Buildings and Grounds*
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JOURNAL
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VOL. XXI December, 1920 No. 252

# ACT OF INCORPORATION

## AS AMENDED BY CHARTER 103 OF THE LAWS OF 1894, CHAPTER 717 OF THE LAWS OF 1896 AND CHAPTER 473 OF THE LAWS OF 1914

## CHAPTER 285

AN ACT to provide for the establishment of a botanic garden and museum and arboretum, in Bronx Park, in the City of New York, and to incorporate The New York Botanical Garden for carrying on the same.

Approved by the Governor April 28, 1891. Passed, three-fifths being present.

**The Corporation**

*The People of the State of New York, represented in Senate and Assembly, do enact as follows:*

SECTION 1. Seth Low, Charles P. Daly, John S. Newberry, Charles A. Dana, Addison Brown, Parke Godwin, Henry C. Potter, Charles Butler, Hugh J. Grant, Edward Cooper, Cornelius Vanderbilt, Nathaniel L. Britton, Morris K. Jesup, J. Pierpont Morgan, Andrew Carnegie, Thomas F. Gilroy, Eugene Kelly, Jr., Richard T. Auchmuty, D. O. Mills, Charles F. Chandler, Louis Fitzgerald, Theodore W. Myers,

William C. Schermerhorn, Oswald Ottendorfer, Albert Gallup, Timothy F. Allen, Henry R. Hoyt, William G. Choate, William H. Draper, John S. Kennedy, Jesse Seligman, William L. Brown, David Lydig, William E. Dodge, James A. Scrymser, Samuel Sloan, William H. Robertson, Stephen P. Nash, Richard W. Gilder, Thomas Hogg, Nelson Smith, Samuel W. Fairchild, Robert Maclay, William H. S. Wood, George M. Oclut, Charles F. Cox, James R. Pitcher, Percy R. Pyne and such persons as are now, or may hereafter be associated with them, and their successors, are hereby constituted and created a body corporate by the name of The New York Botanical Garden, to be located in the City of New York, for the purpose of establishing and maintaining a botanical garden and museum and arboretum therein, for the collection and culture of plants, flowers, shrubs and trees, the advancement of botanical science and knowledge, and the prosecution of original researches therein and in kindred subjects, for affording instruction in the same, for the prosecution and exhibition of ornamental and decorative horticulture and gardening, and for the entertainment, recreation and instruction of the people.

**Purposes of the Garden**

**Powers of the Corporation**

SEC. 2. Said corporation shall have all such corporate powers, and may take and hold by gift, grant or devise all such real and personal property as may be necessary and proper for carrying out the purposes aforesaid, and for the endowment of the same, or any branch thereof, by adequate funds therefor.

SEC. 3. Said corporation may adopt a constitution and by-laws; make rules and regulations for the transaction of its business, the admission, suspension and expulsion of the associate members of said corporation, and for the number, election, terms, and duties of its officers, subject to the provisions of this act; and may from time to time alter or modify its

constitution, by-laws, rules and regulations, and shall be subject to the provisions of Title 3, of Chapter 18, of the first part of the Revised Statutes.

**Board of Managers**

SEC. 4. The affairs of the said corporation shall be managed and controlled by a Board of Managers as follows: The president of Columbia College, the professors of botany, of geology and of chemistry therein, the president of the Torrey Botanical Club, and the President of the Board of Education of the City of New York, and their successors in office, shall be ex-officio members of said corporation and of the Board of Managers, and be known as the Scientific Directors; they shall have the management and control of the scientific and educational departments of said corporation and the appointment of the Director-in-Chief of said institution, who shall appoint his first assistant and the chief gardener, and be responsible for the general scientific conduct of the institution. All other business and affairs of the corporation, including its financial management, shall be under the control of the whole Board of Managers, which shall consist of the Scientific Directors, as herein provided, and of the Mayor of the City of New York, the President of the Board of Commissioners of the Department of Public Parks, and at least nine other managers to be elected by the members of the corporation. The first election shall be by ballot, and held on a written notice of ten days, addressed by mail to each of the above-named incorporators, stating the time and place of election, and signed by at least five incorporators. Three of the managers so elected shall hold office for one year, three for two years, and three for three years. The term of office of the managers elected after the first election, save those elected to fill vacancies in unexpired terms, shall be three years; and three managers and such others as may be needed to fill vacancies in unexpired terms

**Scientific Directors**

**Director-in-Chief**

**Representatives of the City**

**Elective Managers**

shall be elected annually, pursuant to the by-laws of the corporation. The number of elective managers may be increased by vote of the corporation, whose terms and election shall be as above provided; and members may from time to time be added to the Scientific Directors by a majority vote of the Scientific

**Officers**

Directors, approved by a majority vote of the whole Board of Managers. The Board of Managers shall elect from their number a President, Secretary and Treasurer, none of whom or of the Board of Managers, save the Secretary and Treasurer, shall receive any compensation for his services.

**Quorum of the Corporation**

Nine corporators shall constitute a quorum at any meeting of the incorporators, but a less number may adjourn.

**Original Endowment**

SEC. 5. Whenever the said corporation shall have raised, or secured by subscription, a sum sufficient in the judgment of the Board of Commissioners of the Department of Public Parks in the City of New York, for successfully establishing and prosecuting the objects aforesaid, not less, however, than two hundred and fifty thousand dollars within seven years from the passage of this act, the said Board of Commissioners is hereby authorized and directed to set apart and appropriate upon such conditions as to the said

**Grounds in Bronx Park 250 Acres**

Board may seem expedient, a portion of the Bronx Park, or of such other of the public parks in the City of New York north of the Harlem River in charge of the said Department of Parks as may be mutually agreed upon between the said Board of Commissioners and the Board of Managers of said corporation in lieu of Bronx Park, not exceeding two hundred and fifty acres, for establishing and maintaining therein by the said corporation a botanical garden and museum, including an herbarium and arboretum, and for the general purposes stated in the first section of this act. And the said Board of Commissioners is thereupon hereby authorized and directed to construct and equip

within the said grounds so alloted, according to plans approved by them and by said Board of Managers, a suitable fire proof building for such botanical museum and herbarium, with lecture rooms and laboratories for instruction, together with other suitable buildings for the care and culture of tender or other plants, indigenous or exotic, at an aggregate cost not exceeding the bonds hereinafter authorized to be issued by the City of New York; the use of said buildings upon completion to be transferred to said corporation for the purposes stated in this act. And for the purpose of providing means therefor, it shall be the duty of the Comptroller of the City of New York, upon being thereto requested by said Commissioners, and upon being authorized thereto by the Board of Estimate and Apportionment, to issue and sell at not less than their par value bonds or stock of the Mayor, Aldermen and Commonalty of the City of New York, in the manner now provided by law, payable from taxation, aggregating the sum of five hundred thousand dollars, bearing interest at a rate not exceeding three and one-half per centum per annum, and to be redeemed within a period of time not longer than thirty years from the date of their issue.

**Construction of Buildings**

SEC. 5-a. The Board of Estimate and Apportionment of the City of New York may, in its discretion, set apart and appropriate, upon such conditions as it may deem expedient, for the extension and development of the work and objects of the said New York Botanical Garden, the whole or any part of that portion of Bronx Park in the city of New York situated between the southern boundary of the land in Bronx park heretofore appropriated for the use of the said New York Botanical Garden by the Board of Commissioners of the Department of Public Parks, and the northern side of Pelham Avenue; the land so to be appropriated to be described more particularly in

**Power of the City to appropriate additional land**

the Board of Estimate and Apportionment hereby authorized. (Chapter 473, Laws of 1914.)

**Restrictions in use of the grounds**

SEC. 6. The grounds set apart, as above provided, shall be used for no other purposes than authorized by this act, and no intoxicating liquors shall be sold or allowed thereon. For police purposes and for the maintenance of proper roads and walks, the said grounds shall remain subject at all times to the control of the said Board of Commissioners of the Department of Parks; but otherwise, after the suitable laying out of the same and the construction of proper roads and walks therein by the Department of Parks, the said grounds and buildings shall be under the management and control of the said corporation.

**Grounds open and free daily**

The said grounds shall be open and free to the public daily, including Sundays, subject to such restrictions only as to hours as the proper care, culture and preservation of the said garden may require; and its educational and scientific privileges shall be open to all alike, male and female, upon such necessary regulations, terms and conditions as shall be prescribed by the managers of those departments.

SEC. 7. This act shall take effect immediately.

## CONSTITUTION

### ARTICLE I

The provisions of the act of incorporation approved April 28, 1891, as amended by Chapter 103 of the laws of 1894, approved March 7, 1894, are, in pursuance of Section 3 of said act, adopted and form a part of this Constitution.

### ARTICLE II

**Election of Officers**

A President, two Vice-Presidents, a Secretary and a Treasurer shall be elected yearly by the Board of Managers from their number in the manner provided

by section 4 of the act of incorporation; and the persons so elected shall respectively be the President, Vice-Presidents, Secretary and Treasurer of the Board of Managers and of the corporation. There shall also be elected an Assistant Treasurer, who need not be a member of the Board of Managers. Vacancies in either of said offices may be filled by the Board of Managers until the next annual election.

ARTICLE III

**Appointment of committees**

The Scientific Directors and the Board of Managers may respectively appoint such other persons and such committees to aid in the performance of the duties and business of their respective departments as they shall deem best.

ARTICLE IV

**Adoption of By-Laws, Rules and Regulations**

The Scientific Directors and the Board of Managers are each authorized to adopt such by-laws, rules and regulations in their respective departments as shall be approved by them respectively, and also to change or amend the same from time to time; and the same when so adopted by them, shall be deemed the by-laws, rules and regulations of the corporation.

ARTICLE V

**Associate Members**

Associate members may be admitted, suspended or expelled in the manner provided for by the rules adopted by the Board of Managers.

ARTICLE VI

**Patrons, Life Members, Annual Members**

Benefactors, Patrons, Fellows-for-Life, Fellowship Members, Sustaining Members, Life Members and Annual Members may be created by the Board of Managers and admitted upon the payment of such sums as shall be approved and established by the Board.

ARTICLE VII

**Amendments to Constitution**

Amendments to this Constitution not incompatible with the ac of incorporation may be made by a vote of four-fifths of the members present at any regular meeting of the incorporators, or at any special meeting called for the purpose by the Secretary, upon the direction of the President, on ten days' prior notice by mail of such meeting and of the proposed amendments.

## BY-LAWS

I

**Annual Meeting of the Corporation**

The annual meeting for the election of managers and of additional members of the corporation shall be held in the City of New York on the second Monday in January. A notice of such meeting shall be mailed by the Secretary to each member of the corporation at least ten days previous. The number of elective managers may be increased, and vacancies in unexpired terms may be filled, by vote of the corporation at any annual meeting, and also at any special meeting called upon the recommendation of the Board of Managers, upon like notice, and with notice of the proposed increase.

II

**President and Vice-president**

At all meetings of the corporation and of the Board of Managers, the President shall preside; or, in his absence, one of the Vice-Presidents. The President, or either Vice-President, is authorized to approve bills of the Garden against city maintenance appropriations.

III

**Meeting of the Board of Managers**

The managers shall hold an annual meeting on the second Monday in January, following the annual meeting of the corporation. Other regular meetings of the managers shall be held on the third Thursdays of April, June and November. Special meetings may be held by direction of the President, or, in his absence, by the direction of either Vice-President.

IV

**Quorum of the Board of Managers**

Five managers shall constitute a quorum at any meeting of the Board of Managers, providing that not more than two are Scientific Directors.

V.

**Committees**

Committees of the Board of Managers, to be appointed by the Board at each annual meeting, shall include:

An Executive Committee,
A Finance Committee,
A Membership Committee,
A Committee on Endowment.

Special committees may be appointed at any meeting, and may be composed of managers, of members of the corporation, or of both.

VI

**Executive Committee**

The Executive Committee shall consider all matters referred to it at meetings of the Board of Managers or of the Corporation and report at subsequent meetings, and shall annually nominate managers, officers and additional members of the corporation. It shall consist of seven members, including the President, Treasurer and Secretary. The Committee shall annually elect a chairman.

VII

**Finance Committee**

The Finance Committee shall advise the Treasurer concerning investments and reinvestments of permanent funds, and shall have charge of such real estate as may become the property of the Corporation. It shall consist of three members, including the Treasurer.

VIII

**Membership Committee**

The Membership Committee shall consist of three members and shall issue invitations for Annual Members, Sustaining Members, Fellowship Members, Fellows for Life, Patrons and Benefactors.

IX

**Endowment Committee**

The object of the Committee on Endowment is to increase permanent funds; it shall consist of the President, Treasurer, Secretary and two other members of the Board of Managers.

X

**Treasurer**

The Treasurer shall collect, receive and disburse the funds of the Corporation as directed by the Board of Managers. He shall invest and reinvest all permanent funds as advised by the Finance Committee. He shall report to the managers at all stated meetings.

X*a*

**Assistant Treasurer**

The Assistant Treasurer shall perform all duties of the Treasurer during the latter's absence or disability.

XI

**Secretary**

The Secretary shall give notice of all meetings of the corporation, of the Board of Managers and of the Executive Committee, and shall take and preserve the minutes thereof; he shall have the custody of the seal, and shall perform such other duties as may be directed by the corporation, the Board of Managers, or the Executive Committee.

XII

**Quorum of Scientific Directors**

A majority of the Scientific Directors shall constitute a quorum at any meeting.

XIII

**Officers of Scientific Directors**

The Scientific Directors shall elect a Chairman and Secretary, who shall hold office until their successors are elected, and perform the duties which usually pertain to these offices.

XIV

**Meetings of Scientific Directors**

Regular meetings of the Scientific Directors shall be held on the second Saturdays of April, June, October and December, and special meetings may be held pursuant to call by the Chairman.

XV

**Women's Auxiliary**

The Women's Auxilliary shall consist of at least twelve members. Additional members may be elected at any meeting of the managers after nomination by the Auxiliary. This committee shall aid the managers in conducting receptions and other public functions, in obtaining contributing members, and in such other objects as may be referred to it by the Board of Managers. Honorary members of the Women's Auxiliary chosen from women who have rendered noteworthy service to the Garden, may also be appointed by the managers after nomination by the Auxiliary.

XVI

**Elections to be by ballot**

The election of managers and of additional members of the corporation shall be by ballot. All other votes at meetings may be taken *viva voce*, unless a ballot be demanded by some member, whereupon the vote shall be taken by ballot.

XVII

**Amendments to By-Laws**

Amendments to the By-Laws may be made at any meeting by a vote of a majority of the entire Board of Managers and by the unanimous vote of a quorum.

# REGULATIONS FOR THE OFFICE OF DIRECTOR-IN-CHIEF

1. The Director-in-Chief is the Executive Officer of the Garden, and is responsible to the Board of Managers, and to the Scientific Directors, for the general management and control of all its departments.

He shall promptly and efficiently carry out all their regulations and directions, and be responsible for the proper maintenance and good order of the buildings and grounds.

2. He may from time to time make recommendations for the development and management of the Garden in all its departments, including the laying out of the grounds, the construction of buildings and the conduct of the museums, the herbarium or any of the departments of the Garden, accompanying the same by his estimate of the probable cost therefor.

3. He shall recommend the employment of such persons as shall be needed for the various departments of the Garden and have power to remove all employees, except those upon a yearly salary. All such salaried employees he shall have power to suspend, and, on approval of the appropriate committee or board, to discharge.

4. He shall make all necessary purchases of tools, implements and supplies for the Garden as authorized, and shall be responsible for the proper inventory, care, and use of the same.

5. He shall examine, correct and certify all bills incurred under his management, and shall keep, in books provided for that purpose, an accurate account of his expenditure of all appropriations made for Garden purposes, which books, together with proper vouchers, shall at all times be open to inspection by members of the Board.

6. He shall keep a copy of his official correspondence.

7. He shall use diligent efforts to build up the Garden Herbarium, the Library and the Museum, and the collections of living plants and trees, by correspondence, by exchanges of duplicates not needed, and by purchases, so far as means therefor are placed at his disposal.

8. He shall report to the Board of Managers, the Scientific Directors, or special committees, in such manner and at such times as they may direct.

9. He shall make no expenditures and incur no liabilities, except under appropriations made by the Board.

10. He shall devote his whole time and energies to the promotion of the Garden interests, and shall not engage in any outside work except with the approval of the Board or the Executive Committee.

---

## PROVISIONS FOR CONTRIBUTING MEMBERSHIP

1. *Benefactors.*—The contribution of $25,000.00 or more to the funds of the Garden by gift or by bequest entitles the contributor to be a benefactor of the Garden.

2. *Patrons.*—The contribution of $5,000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a patron of the Garden.

3. *Fellows for Life.*—The contribution of $1,000.00 or more to the funds of the Garden at any one time shall entitle the contributor to be a fellow for life of the Garden.

4. *Fellowship Members.*—Fellowship members pay $100.00 or more annually and become fellows for life when their payments aggregate $1,000.00.

5. *Sustaining Members.*—Sustaining members pay from $25.00 to $100.00 annually and become fellows for life when their payments aggregate $1,000.00.

6. *Annual Members.*—Annual members pay an annual fee of $10.00. All members are entitled to the following privileges:

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2. Invitations to all exhibitions given under the auspices of the Board of Managers.

3. A copy of all handbooks published by the Garden.

4. A copy of all annual reports and Bulletins.

5. A copy of the monthly Journal.

7. *Life Members.*—Annual Members may become Life Members by the payment of a fee of $250.00.

*Form of Bequest.*—I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of .. ... .....

---

## PROVISIONS OF THE CHARTER OF THE CITY OF NEW YORK FOR MAINTENANCE

§ 613. It shall be the duty of the commissioner for the boroughs of Manhattan and Richmond to maintain the meteorological and astronomical observatory, the Museum of Natural History, the Metropolitan Museum of Art in Central Park, the Aquarium in Battery place, and such other buildings as now are or may hereafter be erected in such parks or in any other park, square or public place under his jurisdiction by authority of the board of aldermen. It shall be the duty of the commissioner for the boroughs of Brooklyn and Queens to maintain the Brooklyn Institute of Arts and Sciences, and such other buildings as now are or may hereafter be erected in any park, square or public place under his jurisdiction by authority of the board of aldermen. It shall be the duty of the commissioner for the borough of The Bronx to maintain the New York Botanical Garden and the buildings appurtenant thereto, and such other institutions or buildings as may be established or erected in any park, square or public place in his jurisdiction by authority of the board of aldermen. It shall be the duty of the several commissioners to provide the necessary instruments, furniture and equipments for the several buildings and institutions within their respective jurisdictions, and, with the authority of the board of aldermen, to develop and improve the same, and to erect additional buildings; but the maintenance of all such buildings and institutions shall be subject to the provisions of the acts incorporating said institutions, or either of them, and the acts amendatory thereof, and to the powers of said corporations thereunder, and of the boards by such acts created or provided for; and shall also be subject to and in conformity with such contracts and agreements as have heretofore been made with such institutions respectively,

and are in force and effect when this act takes effect, or as may be hereafter made by the authority of the board of aldermen, and no moneys shall be expended for such purposes unless an appropriation therefor has been made by the board of estimate and apportionment and the board of aldermen. Out of the moneys annually appropriated for the maintenance of parks each commissioner may apply such sum as shall be fixed by the board of estimate and apportionment for the keeping, preservation and exhibition of the collections placed or contained in buildings or institutions now situated or hereafter erected in the parks, squares or public places under the jurisdiction of such commissioner.

§625. The commissioner for the borough of The Bronx is hereby authorized and directed to carry out the existing contract made by and between the department of parks of the corporation heretofore known as the mayor, aldermen and commonalty of the city of New York and the board of managers of the corporation known as the New York Botanical Garden pursuant to the provisions of chapter two hundred and eighty-five of the laws of eighteen hundred and ninety-one, entitled "An act to provide for the establishment of a botanic garden and museum and arboretum in Bronx park in The City of New York and to incorporate the New York Botanical Garden for carrying on the same," as amended by chapter one hundred and three of the laws of eighteen hundred and ninety-four, which contract provides for the alloting and setting apart for the uses of said garden of two hundred and fifty acres of land or less in the northern part of Bronx Park as shown upon a certain map thereof numbered five hundred and sixty-eight, and signed by Messrs. Vaux and Parsons, and filed with the former department of public parks of the corporation known as the mayor, aldermen and commonalty of the city of New York.

## NOTES, NEWS AND COMMENT

On the afternoon of November 20, Miss Slater brought a group of Nature-Study teachers to the Garden to get them acquainted with the collections of living plants and other facilities for teaching their subject. At the close of the excursion, they attended a lecture in Conservatory Range 2 by Dr. Gleason on "Tropical Beverage Plants."

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*Meteorology for October*: The total precipitation for the month was 1.38 inches. The maximum temperatures recorded for each week were as follows: 80° on the 4th, 86° *on the 14th*, 84° on the 21st, and 73° on the 26th and 27th. The minimum temperatures were 43° on the 6th and the 13th, 39° on the 24th, and 34° *on the 30th*.

---

The following visiting botanists enrolled in the library during the autumn: Professor Alfred C. Hottes, Columbus, Ohio, Professor Etienne Foex, Paris, France, Dr. Norma E. Pfeiffer, Grand Forks, N. D., Mr. G. W. Martin and Mr. Elba E. Watson, New Brunswick, N. J., Mr. A. C. Fraser, Ithaca, N. Y., Dr. Emmeline Moore, Albany, N. Y., Mr. William W. Diehl and Mr. W. W. Eggleston, Washington, D. C., Professor Frederic E. Clements, Tucson, Ariz., Prof. H. M. Hall, Berkeley, Calif. and Dr. Roland M. Harper, College Point, L. I.

# INDEX

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Mrs. F. K. Sturgis,
Mrs. F. F. Thompson.

# Provisions for Benefactors, Patrons, Fellows, Fellowship Members, Sustaining Members, Annual Members and Life Members

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4. A copy of all annual reports and Bulletins.
5. A copy of the monthly Journal.
6. Privileges of the Board Room.

## 7. Life Members

Annual members may become Life Members by the payment of a fee of $250.00.

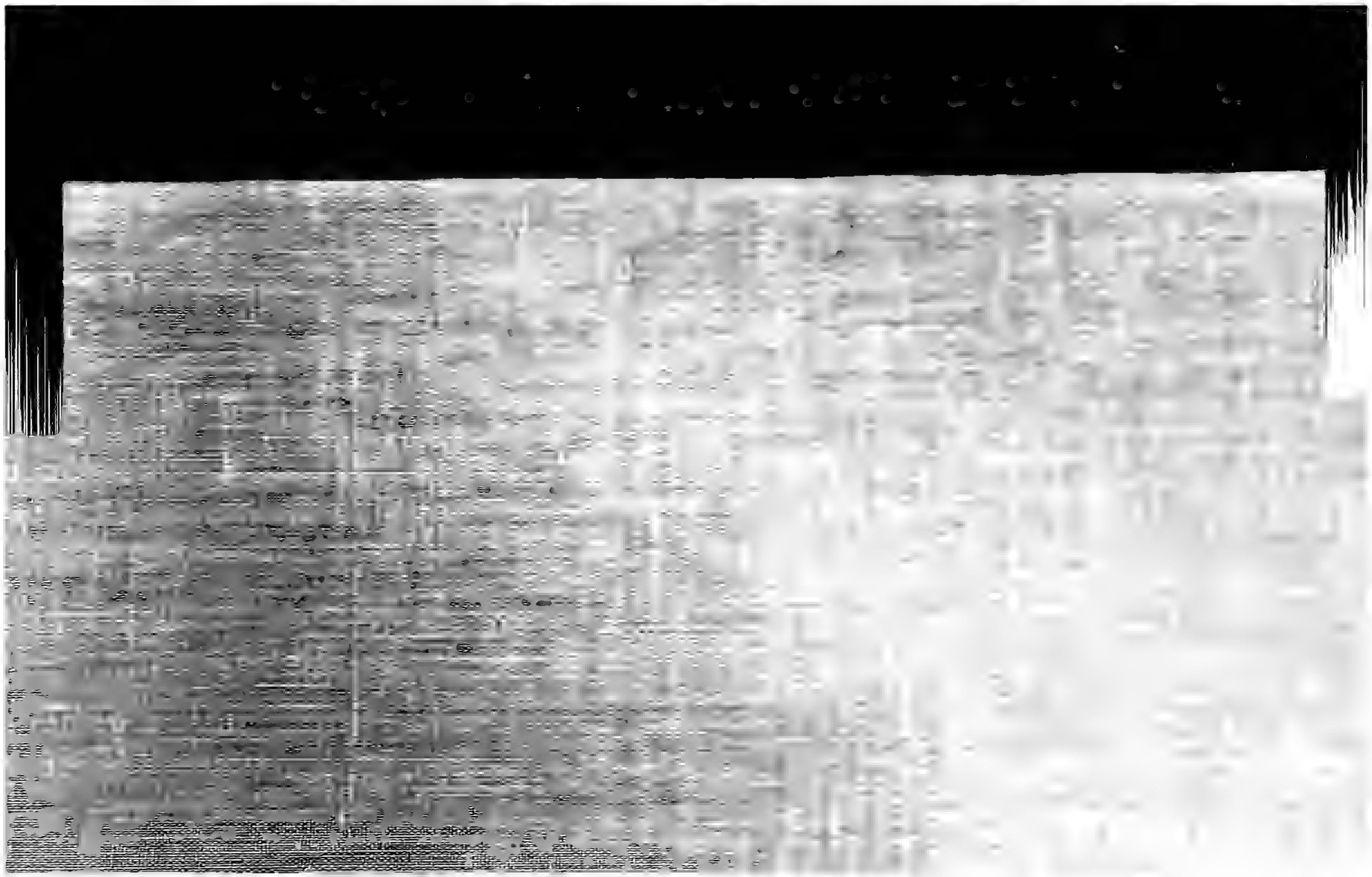
## Information

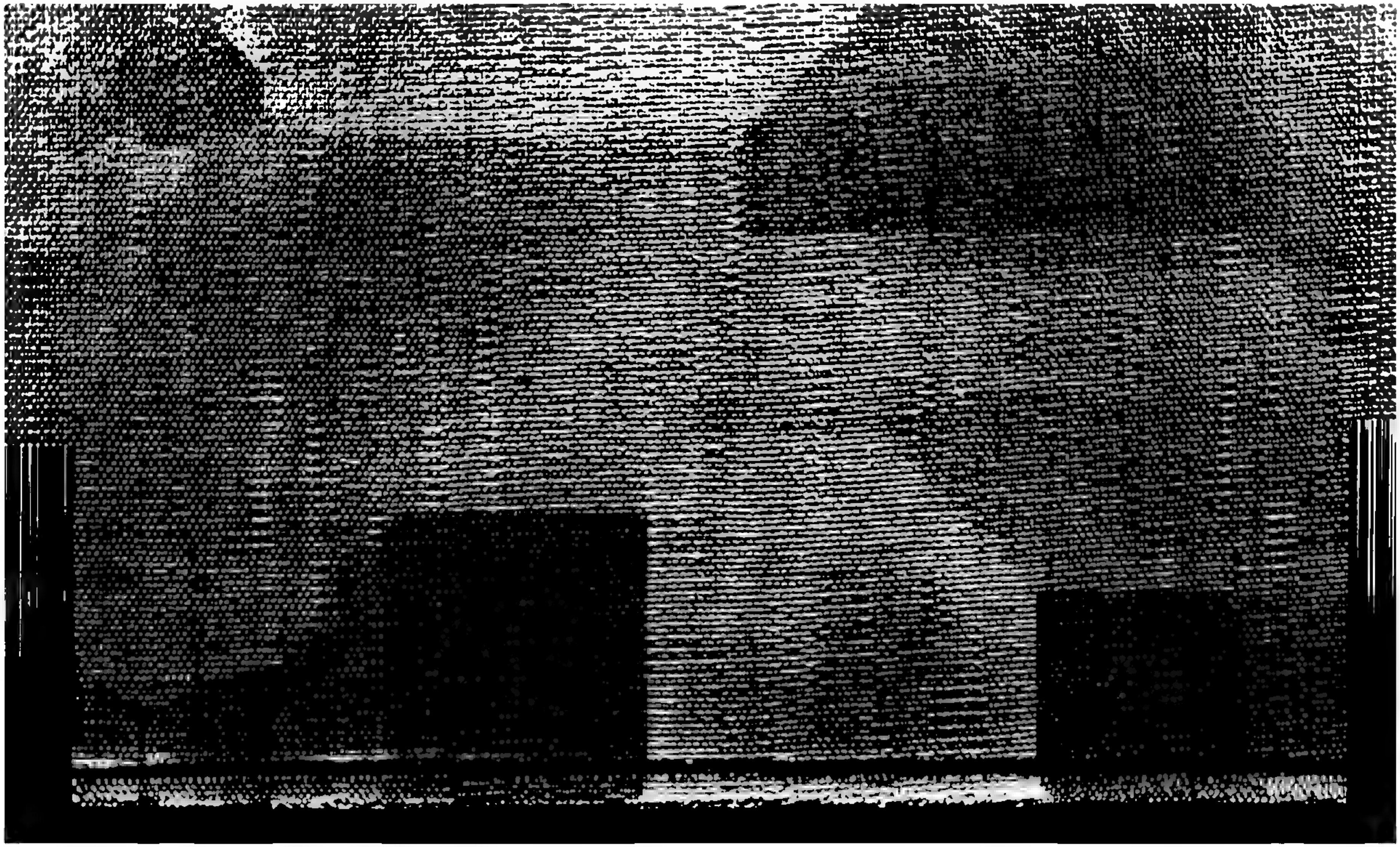
Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

## Form of Bequest

I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....

N S.





# JOURNAL

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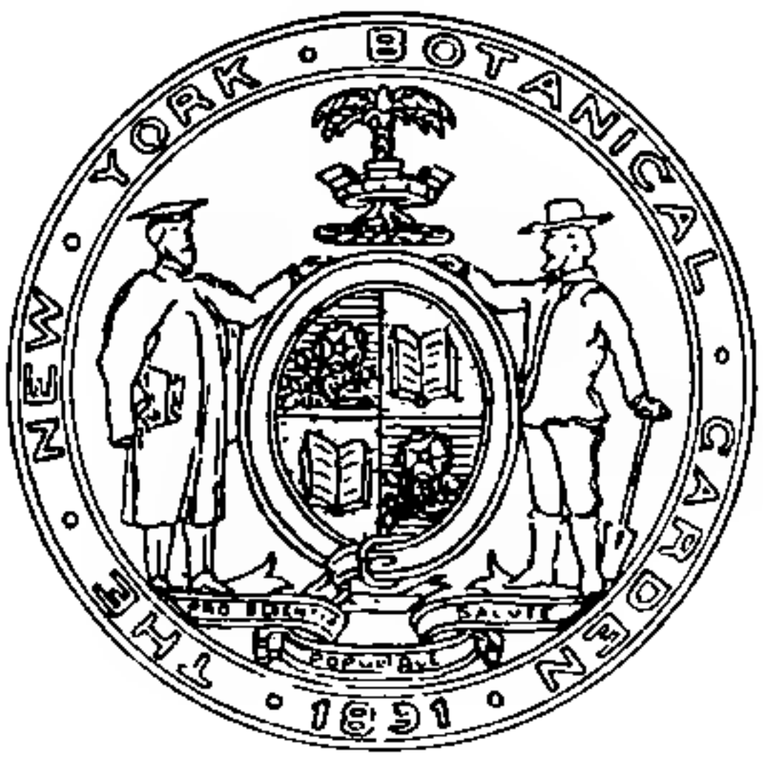


VOLUME XXII

WITH 13 PLATES

1921

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EDITOR

R. S. WILLIAMS

*Administrative Assistant*

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# REMINISCENCES OF ALVAN WENTWORTH CHAPMAN

In answer to the door-bell early one morning in December, 1917, I was brought face to face with a stranger standing on the porch of our house in Apalachicola. The visitor announced that he had been attracted by a plant of a genus foreign to this part of Florida, growing in our front yard. Would we give him some information concerning it? I started out by telling him the botanical name of the plant, that it was a cycad, and that it had relatives in the West Indies and in the Old World.

"I know all that myself," he answered patiently. "What I want to know is, where did you get it?" I opened my eyes a bit and really looked at him. "If you know *that* much you do know something about plants," I remarked. He nodded and announced himself as a member of the staff of The New York Botanical Garden.

He was then told the plant came from peninsular Florida, whence Doctor Chapman had brought it many years ago.

After having thus been introduced by *Zamia* I related some incidents of Doctor Chapman's life. Doctor Small was interested. He considered my idle memories of value; and he requested me to write some of these incidents and some of my experiences with Doctor Chapman, so that they might be given to others. Hence the following notes:[1]

[1] This document, prepared at the request of the undersigned, is a welcome addition to the too scant Chapman biographies and is the first written by one who was an intimate friend of the subject of the sketch, as well as the first to give the personal side of a man who was isolated from the other botanists of America. It is particularly fitting that it be published in our *Journal*,

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I saw Doctor Chapman[1] first in April, 1887. We had come to Apalachicola on a visit, as my father was doing some Government work in the harbor, and he thought that this queer old abandoned city would interest my mother. So he brought his family and installed us all in the "Fuller House." That tavern is worthy of note in itself. It was a private residence before the Civil War, and was left, entirely furnished as it stood, by Madame Fuller upon her death, to "Uncle William" just prior to "Lee's Surrender." Now "Uncle William" was her husband's body servant, and during all those perilous days, first when her husband was at the front and then after his death, this negro stood at her side, ran all her affairs, and at times provided the very wherewithal of life. So when she came to the "Crossing," she left everything she possessed to this ex-slave, and now "Uncle William" ran the best hotel in town. Here all the "old timers" gathered, while the Yankees went to the hotel run by "po' white trash."

Doctor Chapman took his meals here. One day he saw my mother working around a syringa bush—one of the relics of a

as Doctor Chapman's main and original herbarium, the one on which the first edition of his "Flora of the Southern United States" was based, is now among the collections at The New York Botanical Garden. Among his books at the Garden is his "Catalogue of Southern Plants," a manuscript which was the basis of his "Flora."—JOHN K. SMALL.

[1] Alvan Wentworth Chapman, son of Paul and Ruth (Pomeroy) Chapman, was born September 28, 1809, at Southampton, Mass. He entered Amherst College in 1826, graduating (B. A.) in 1830; from 1831 to 1833 he was a teacher in a family on Whitemarsh Island, near Savannah, Ga.; in 1833 he was elected principal of the academy at Washington, Ga., and while there began the study of medicine, which he continued upon his removal to Quincy, Fla., in 1835, where he began to practice his profession the next year; in the summer of 1837 he moved to Marianna, but after a few months returned to "Rocky Comfort," near Quincy; in 1847 he settled at Apalachicola, where he practiced medicine for more than half a century. His interest in botany began before he left New England; the genus *Chapmania* was named in his honor as early as 1838; his "Flora of the southern United States," first published in 1860, and running through several editions, was for nearly fifty years the only manual of flowering plants of the southeastern states. He married in November, 1839, Mrs. Mary Ann Hancock, daughter of Benj. Simmons, of New Berne, N. C.; she died at Rome, Ga., in 1879. In 1886, the University of North Carolina conferred upon Chapman the degree of LL.D. He died at Apalachicola, April 6, 1899, in his ninetieth year.—JOHN HENDLEY BARNHART.

once beautiful garden which was struggling for life against overwhelming odds. "The Doctor," as we soon learned to call him, came over and said, "Madam, I see that you love flowers."

From that day on an intimacy, then established between this grand old man and my family, held firm until his death in his ninetieth year. For in time business brought our family permanently to Apalachicola and we built a home here.

We built a home; and my mother planted a garden![1] Oh, what a delightful time she and "The Doctor" did have—experimenting with impossibilities! When a South American ship brought up clay from the "Rio de la Plata" as ballast, and my father had it spread over the garden, Doctor Chapman's interest grew apace. He watched each new "weed" that cropped up.

It was about this time that I began to study botany with him, and to accompany him on his long jaunts through the pine woods and deep into the titi swamps.[2]

I can see him just as he used to look as he walked on ahead carrying the japanned box of specimens; for he was one of the gentlemen of the old school, and sturdy a girl as I might be, my

[1] Among the plants early introduced into that garden and still thriving is the *Zamia* already referred to. Whether it came from the northern part of the peninsula or from the southern part of the State, will, perhaps, never be known. It is typical *Zamia floridana*, which grows more or less abundantly in pinelands from the latitude of Gainesville to the lower Florida Keys. It is not now generally known that Doctor Chapman once visited Key West. However, in a letter to Doctor Torrey, written from Apalachicola, 1847, he said, "I saw Dr. Blodgett at Key West four years ago . . . ." Thus, the plant in question may have come from the northern part of the peninsula, which region Doctor Chapman doubtless visited, or he may have brought it back with him from Key West. This plant was, very likely, native on Key West before its pinelands were devasted, or it may have been cultivated there from plants derived from the nearby Miami region, which is the center of its distribution as far as abundance is concerned. At any rate, the plant has long been grown at Apalachicola where it thrives, as is attested by specimens in the garden of Doctor Chapman's old house, on his grave, in the garden of the Kimball house, as well as in other front yards in the town. J. K. S.

[2] Besides the pinelands, the titi swamp or titi bay is one of the most prominent plant associations in the flatwoods in the Apalachicola region. The titi, a shrub or tree, known botanically as *Cliftonia monophylla*, is the conspicuous plant feature. When in flower the myriads of snow-white flower-clusters eclipse all other vegetation.—J. K. S.

sex forbade me to carry anything. Doctor Chapman was a very handsome man. He stood over six feet. His hair was of that fine white texture that is likened to snow, but in reality has no similarity; it was the kind of white hair that age and clean thought give to a man. A brain had to do clear thinking to be thatched with such white hair. His eyes were clear and blue, and with all the enthusiasm and purpose of youth in their glance. He was even a bit of a dandy and always wore dark blue suits. He was insistent that he was a New Englander, as he was by birth; and his profile spoke of that hardy Puritan stock. He was very dignified in his movements—he walked slowly with head slightly forward, a habit acquired from searching the ground for its shy flowers. When he did not have that tin box, his hands were clasped behind his back. He was very deaf, but his sight was remarkably good, with the exception noted below.

In his youth Doctor Chapman must have been a hard man—one very stern of purpose. I remember his telling my mother stories of the war that confirm this idea. "I was a Union Man" he said; "and right there my wife and I disagreed. For she was a Secessionist, and when she would not change nor see my point of view, we agreed to part. She went to her home in Marianna. I stayed here. I never saw her during those four years. Yes, I heard from her once. She sent me four shirts. They were very good shirts, and I thanked her for them. That was all. When the war was over she returned. Did I miss her? Yes, some—but, my dear friend, those were very stirring years."

Yet he disliked to talk of those days, and many of the stories that I heard of that time came from a mutual friend, who was the son of one of the Doctor's patients and a satellite of his. This lad was so devoted and so faithful that he grew to be of great service, so that Doctor Chapman relied upon him in many ways. For just because he was a Union man his life was proscribed, and when the guerillas swept through the city on their too numerous raids they made for his drug store every time. But the Doctor's friends always warned him. Then, if the time was short, he would betake himself to Trinity Church and spend the night there in hiding or for such time as the raids lasted. "That is why you will still find cushions in my pew,"

he used to say. "If I must hide, I decided that I might as well be comfortable."

You see, he was the only surgeon in the city, and that fact saved his life; for even his enemies had a wholesome fear of the diseases that were rife during Dixie's tumultous four years of war, and Doctor Chapman was a clever physician as well. "But," he said, ''I would not have given a sixpence for my life many times during those four years."

Andersonville prison was situated near the Flint River. All the escaping prisoners that trusted to the river, and survived the horrors of the trip, eventually reached Apalachicola. One of the Doctor's own slaves would notify him that some of these wretched creatures were hiding in the marsh. Then Doctor Chapman would find his boy friend, who had a boat, and that lad would scurry off to get this craft. All the boats that the Doctor himself once owned had been destroyed; so this boy's old dugout would be prepared, and when the night was darkest, he and the Doctor would row the Yankee soldiers out to the blockading vessels.

Often the boy went alone, for the Doctor was watched too closely to risk the trip. But it was fine sport for the lad. "Never have I been so royally treated as I was on board those Yankee cruisers," he said. "And the worst of it was, I had to go back home and hold my tongue when my mother told father I was entirely too young to join our town guard."

But to return to our subject.

"I did not do much botanical work in those days," the Doctor would say; "I was too busy doctoring. Still, dear madam, there is a lot of pother in this doctoring; and I find that my deafness is not entirely detrimental, since if I can't hear people's groans they won't send for me. My flowers are far more satisfactory. That reminds me: If people did but know it, fresh air and sunshine, just what keeps the plants growing, will keep most of us well. Why, unless it was a case of easing a soul in or out of the world I did my best practice with hot baths and bread pills."

I asked him when he began to really botanize. He answered, "My love for all flowers began to develop soon after I came

South.[1] I think I first began to give up my medical practice and devote more attention to plants when I went up to Marianna the summer after Appomattox and visited my wife. I used to walk through the fields a good deal, and I began to note the humors and peculiarities of the growing things." He smiled. "I had had quite enough experience with human ills by that time."

I am not sure but I think it was several years after this time that he met Doctor Torrey in Florida, and they ranged through the hills in the region where the Flint and the Chattahoochee Rivers meet to form the Apalachicola River.[2] I know that the story of the discovery of the *Torreya taxifolia*[3] by his friend Mr. Croom was very dear to his heart; and he was always trying to make the tree grow in other places.

"I can't do it," he would exclaim. "That tree will grow around that locality and it won't grow elsewhere. Torrey tried to grow it North, but he never succeeded. Transplanted specimens sulked along in several places, but not many plants lived. And they make fence posts of it at Alum Bluff!"[4]

[1] Doctor Chapman's first letter to Doctor Torrey was dated "Gadsden Co., Fla., January 12, 1835" and mailed at Quincy the same day. This and four more letters before the end of the same year, attest his botanical knowledge and enthusiasm at that time. Torrey & Gray, Flora 1: 355. 1838, mention Doctor Chapman as "an accurate and indefatigable botanist."—J. K. S.

[2] Doctor Torrey made a pilgrimage to the Chattahoochee country in the winter of 1872, the year before his death—many years after the tree in question had been discovered and named in his honor. He never published an account of his visit and there is no evidence that he traveled as far south as Apalachicola.—J. K. S.

[3] Under the present rules of botanical nomenclature this tree is known as *Tumion taxifolium*.

[4] The tree, evidently, does not transplant and thrive readily. However, there are several successful instances on record: Two seedling plants were given to Doctor Torrey at New York by Mr. Croom the discoverer. One of these, sent to Newburgh, New York, was lost sight of; the other, planted in Central Park, New York, grew, and furnished sprigs of foliage which were worn by members at the formal organization of the Torrey Botanical Club (1867) and at Doctor Torrey's funeral (1873). This tree is, apparently not now living. Dr. Asa Gray records in the American Agriculturist for 1875 that, "I have been told that two seedlings of *Torreya* which Mr. Croom planted near his house at Quincy, Florida and which had become stately trees, have recently been demolished by the present proprietor; also that a tree of Mr. Croom's planting still flourishes in the grounds of the state-house at Talla-

He was kind and patient, and as a teacher was most interesting. He made many plans for me, which in my youthful egotism I rejected. I know now that I should have done well had I followed this friendly counsel. He wanted me to take up his work, so that there should be some one here to wear the mantle of his life research. When I failed him he closed in upon himself; for he had no children of his own.

Mrs. Chapman was a widow with one daughter when Doctor Chapman married her. This daughter married Doctor Chapman's most intimate friend, and the two children of this marriage were treated as if they were his own granddaughters. When one of these young ladies visited Europe she had the entrée into the highest social circles. The second brother of the old German Emperor William I was an eager botanist, and he became a friend of this young lady. All court circles were opened to her. This prince became so enamored with Doctor Chapman's ward that he proposed a morganatic union which, when the Doctor got wind of it, so incensed him that he cabled for the stepchild's immediate return to America.

My memories of those days when I studied with Doctor Chapman grow more and more disconnected, and I find myself putting down things which happened in the order of their personal interest—not at all as they occurred. For instance: one day I went in to see him and he was at work upon some kind of fern. Botanists must excuse me for not being more technical. He was studying the spores of these plants, and all the work was done under a microscope. He looked up as I entered. "Come here, my child," he said, " and look at these."

I looked, and I grant you that I saw nothing interesting in those brown particles as the glass revealed them.

But he continued: "Behold the hand of the Almighty at its incredible task! The spores of these particular ferns are all coordinated in multiples of four. Never an exception. And if the All Seeing has carried his law of order to even these

hassee." "There are three or four specimens of Torreya on the Capitol grounds at Tallahassee and many in other parts of town," according to information recently received from Doctor R. M. Harper. Of course, Quincy and Tallahassee are not far from the general region for *Torreya*. A paper on *Torreya* and its distribution was published by Doctor Chapman in the Botanical Gazettee **10**: 251–254. 1885.—J. K. S.

minute spores, has he not so governed the whole world that no man need fear?"

That was as near as he ever came to being "religious." In fact, he was called an "irreligious" man. That was because in his day men who did not underscore every letter of the Credo were called heathens.

"The pendulum had to swing back the other way," he would exclaim, "My father was a 'blue Presbyterian,' predestination, damnation, and all the rest made life, the Sabbaths especially, miserable to me. They pulled that old pendulum too far, and they made us what we are."

"If I have a creed," he said to me on another occasion, "it is summed up in these words:

> 'He prayeth best who loveth best
> All things both great and small;
> For the dear God who loveth us,
> He made and loveth all.' "

On his return from a visit north, where he met Doctor Gray for the last time, he told us of a visit that the two friends made to Doctor Chapman's old home.

"We went all over the old place," he said. "It looked very much as it used to when I was a boy. They don't change much up there. When I walked out into the garden, there I saw the brass sugar kettle of the old times. When my eyes rested on that kettle I saw it just as it looked over sixty years ago when they put me to stir the boiling syrup—and I let it burn."

His face hardened as he remembered his injury.

"It was an unmerciful licking I got," he said, "and an unjust one. When I saw that kettle my gorge rose—I said out loud, 'Damn that kettle.' How Gray laughed when he understood!"

Doctor Chapman told me one evening of another incident of the same trip—one that was to remain very dear to his heart, for Doctor Gray died the season following. It seems that he and his friend, Gray, were particularly interested in violets, and Doctor Chapman said that there was a violet in New England that Gray did not have in his collection. Now, botanists will understand all the significance of such a declaration, for it became imperative for Doctor Chapman to prove his statement.

So he made a trip up to the country town where he had remembered finding this shy sister. It was late in the season, but he hoped to find one single specimen. He searched and searched, but could find nothing. He gave up and was returning to catch his train. The matter would have to lie over another year, but, just before he came to the station, right there in a corner of the fence, he found his violet—a perfect specimen in every botanical way.

"How did it get there?" he cried. "You need not tell me my eyes weren't directed to it. Just remember the multiples of four of those spores! Anyhow, I took off my hat and I said, 'I thank You!' " Now the violet is in Doctor Gray's herbarium.

Doctor Gray visited Doctor Chapman down here. It was before our acquaintance began; but I have heard him tell this story of his friend's visit:[1] "I had been writing Gray that I had found a new *Rhododendron*, and between you and me I really think it was this plant that brought him South. Anyway, we went after it. Fortunately, he came early enought to catch the pretty witch in bloom. I took him out to the reaches where the flower grew. It always looked white to me, but Gray said it 'blushed pink.' He looked at it several moments, then he knelt down and studied it closely. When he arose he came and offered me his hand. 'You are right,' he said. 'I never saw

[1] "I will not here give any account of a delightful ten days' episode, [at Apalachicola] . . . . Then followed a week and more at dead and dilapidated, but still charming, Apalachicola, where the post-office opens Monday evenings, when the steamboat arrives, and closes for a week the next morning, when she departs,—where the climate, thanks to the embracing Gulf, is as delicious in summer as it is bland in winter; where game, the best of fish, and the most luscious oysters are to be had almost for nothing, and blackberries come early in April when the oranges are gone; and where, far from the crowd and bustle of the world, with Bill Fuller for caterer, and his wife Adeline for cook, the choicest fare is to be enjoyed at the cheapest rate. Then there was the pleasure of renewing our acquaintance with Dr. Chapman, and botanizing with him over some of the ground which he has explored so long and so well; of gathering, under his guidance, the stately *Sarracenia Drummondii* in its native habitat, and, not least, acquiring from him fuller information respecting the localities where *Torreya* grows." Asa Gray in American Agriculturist **34**: 266–267. 1875. Doctor Gray gives, in the paper from which the above paragraph is quoted, a full account of his visit to stations for *Torreya*. However, he never wrote, at least never published a further account of his experiences at Apalachicola.—J. K. S.

this species. I congratulate you on *Rhododendron Chapmanii.*' "

This incident brings me to a peculiarity of the Doctor's sight which was a great cross to him. He could not detect the color red in any of its shades. Blue was perfect, but a red rose for him was so dull that it looked like a dusky brown, and pinks were all white. This failing was the cause of many of our interviews, for he always came to my mother or to me to have his flowers described in shade and hue.

An active mind will surely keep itself as well acquainted as possible with all the literature that relates to its own metier; but it is an unusual one that will pick up a foreign tongue at the age of eighty years and in six months learn it so that the student can read books and letters sent to him. Gladstone, I believe, was one of the few men who has done a thing like this, but our doctor was even older than he. For when he was eighty he started to study German.

"I get so many letters and books from my German co-workers; and I want to read them myself," said he.

In six months he had acquired all the German he needed to carry on his voluminous correspondence with the botanists of that country; for Doctor Chapman was as well known abroad as he was at home.

He, of course, read Greek and Latin, and he was a lover of French. He had a fine old library, but being very generous with his books it is only the skeleton of it that went to Biltmore, North Carolina, and is now at Washington. Why, one day I was browsing through his books and I called out: "Oh, Doctor. let me take your Josephus home, I want to read it." He turned to me, puffing away on his pipe—for he was an inveterate smoker—"Take them all and keep them, my child, for I don't know of anyone else in this town who would be fool enough to want to read them!" I have the books today and I prize them. Still, Doctor Chapman was right. That was twenty years ago, and no one else has ever asked to borrow them!

There is one other story that he told us that is of interest to more than just his personal friends. He was a great friend of Doctor Gorrie,[1] perhaps the dearest, nearest friend that great

[1] John Gorrie was born at Charleston, South Carolina, October 3, 1803. He settled in Apalachicola as a physician in 1833, and resided there until his death, June 18, 1855. Artificial ice had been prepared in an experimental

scientist had, and his account of the discovery of manufactured ice holds enough interest to bear recording.

"One day Gorrie came to me back of the prescription counter, where I was making bread pills, I believe, and his eyes danced as they always did when he jibed at his own profession. He was sort of fussed up. He said: 'Come on over to my workroom—I believe I've stumbled on *it*.' Now, I knew that he was working hard trying to find a way to cool hospital wards in our tropical climate," Doctor explained to us—and we well understood how such a need would interest both these physicians.

"So," he continued, "I asked him, 'have you got it?' We crossed over to his home, and there he showed us the first piece of manufactured ice. He had stumbled on it indeed! 'You've got a great thing here,' I exclaimed. 'Yes,' he laughed, 'and I'm going to get those Yankee cotton-brokers. The ice-ship is late—no ice for the dinner they are giving the English brokers. We'll wager that there will be ice for that dinner—and I'll make the ice!' He did it. We won the wager. And we had the ice! It was a great dinner we had that night."

"How much did Doctor Gorrie make from his invention?" I asked. Doctor Chapman shook his head.

"Relatively nothing. He was no business man, was Gorrie. If he had been he never would have invented artificial ice!"

When I survey my acquaintance with Doctor Chapman, I am impressed with the sweetness of it. Never a thing to repel you; yet he has been called a very stern and haughty man. He was not. Only, if you interest yourself with plants, flowers, and all the teeming life of the world, you have little time for the pettiness of people. He lived, and gave himself to his profession and to a few friends; to the rest of the town his deafness served as an excuse for an isolation that he welcomed.

WINIFRED KIMBALL

way for more than a century, but he was the first to invent and patent an ice-machine for practical use. Recognition of Gorrie as one of the great benefactors of the human race has been slow. Even now, when there is a monument to his memory at Apalachicola and a statue in the Capitol at Washington, one may search through the long article upon "refrigeration" in the latest edition of the Encyclopaedia Britannica without finding any mention of Gorrie's name.—JOHN HENDLEY BARNHART.

## WILD FLOWERS OF NEW YORK

The New York State Museum has recently completed the publication of its Memoir No. 15, containing descriptions and illustrations of selected wild flowers inhabiting the state, written by Dr. Homer D. House, State Botanist. This Memoir is issued in two parts, of about equal size, containing collectively 264 plates printed in color, reproduced from photographs taken by Dr. House in various parts of the state, and there are a number of text figures as well. The descriptions are drawn so that any person of ordinary scientific education can understand them without effort. The distribution and habitat of the plants illustrated are given. There is a complete list of illustrations and a comprehensive index.

The excellent photographs taken by Dr. House are reproduced for the most part with great accuracy and the color reproduction is very true to nature. The work is a noble contribution to the natural history of the state and cannot fail to stimulate observation on its wild flowers and their relation to soil and climate, and also to increase interest in the preservation of many of the rarer and more beautiful species which locally are in danger of extermination by indiscriminate picking.

It is with unusual pleasure that we are adding these two elegant volumes to the library of the Garden, and express our appreciation of this work to Dr. House, who was a student of the New York Botanical Garden in 1903 1904, a museum aid here in 1907–1908, and has been State Botanist of New York since 1913. At the same time we would congratulate Dr. John M. Clarke, Director of the State Museum, on the successful production of this important work, so largely due to his interest and encouragement.

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# WILLIAM HARRIS

Mr. William Harris, Assistant Director of Agriculture and Government Botanist of the island Jamaica, British West Indies, for many years a highly valued correspondent of the New York Botanical Garden, and an efficient cooperator in all field work in Botany carried out in Jamaica by students from England and the United States, died at Kansas City, Missouri, on October 11, 1920. He had been ill for several months, and came north early in September for medical treatment, but his malady proved to be incurable; he was born at Enniskillen, Ireland, November 15, 1860, and was thus about sixty years old and had been in the service of the Jamaica Department of Agriculture as Superintendent of Public Gardens and Plantations and in related branches of that government for nearly forty years; since arriving in Jamaica at about the age of twenty, after about two years' training as a gardener at Kew, he had never been away from there until his trip to the United States to be with his son in Kansas City this last autumn. All his official duties were carried out with devotion and fidelity, and he was a very successful and esteemed administrator of the several botanical gardens and establishments of the colony, Hope, Castleton, Cinchona and Bath.

Harris was a born naturalist; he early became interested in the native vegetation of Jamaica and studied it intensively up to the time his fatal illness incapacitated him, serving practically as insular botanist in addition to his official gardening and agricultural duties; these took him widely over the island, in addition to visits to the gardens under his charge, and he knew the hills, mountains, savannas and coasts as well, doubtless, as they have ever been known by any one.

The care of the herbarium at Hope Gardens came under his charge, and he soon began collecting specimens to increase it, with such diligence that his collection has now become one of the most important repositories of botanical information in tropical America; his botanical collecting was begun as early as 1891, when, assuming an arbitrary number 5000 to represent the approximate number of specimens in the Jamaica herbarium, he continually increased it up to 12909, preserving, as a rule, several duplicate specimens of each number, which found their

way to museums in Europe and America, where they are highly valued; since 1904 his collecting has been in cooperation with the New York Botanical Garden, and his duplicate specimens have been mostly distributed from here to other institutions.

My personal acquaintance with Mr. Harris dates from the autumn of 1906, when I visited Jamaica to prosecute botanical investigations,[1] at which time he accompanied our party during a study of the rough Cockpit Country and elsewhere; we were with him again in the late summer of 1907, exploring the Santa Cruz Mountain Range and Westmoreland;[2] again in the spring of 1908, when we studied most of the coast-line and parts adjacent, using a schooner,[3] and also in the late summer of that year, studying especially in the Blue Mountains and in the parishes of Manchester and St. Thomas.[4] My last field work with him was in the spring of 1909, exploring the difficult John Crow Mountain Range,[5] and I have not seen him since that memorable expedition; our correspondence has been continuous however, and is, collectively, voluminous.

He was one of the most enjoyable scientific companions I have ever known, whether in the field or in the laboratory, always cheerful, active and original, and he would always find means of obtaining plants we wanted to see for one reason or another. His contribution to knowledge of the vegetation of Jamaica is highly important as a scientific achievement and his name will forever be associated with the subject. He is commemorated by a number of species, new to Science, named in his honor, by the Cactus genus *Harrisia* and by the Orchid genus *Harrisiella.*

N. L. Britton

[1] Journ. N. Y. Bot. Gard. **7**: 245–250.
[2] Journ. N. Y. Bot. Gard. **8**: 229–236.
[3] Journ. N. Y. Bot. Gard. **9**: 81–90.
[4] Journ. N. Y. Bot. Gard. **9**: 163–172.
[5] Journ. N. Y. Bot. Gard. **10**: 99–102.

## BEQUEST OF MARY J. KINGSLAND

A bequest of five thousand dollars to The New York Botanical Garden by Mrs. Mary J. Kingsland, was received from the executors of her estate in the summer of 1920, and on recommendation by the Endowment Committee this gift has been appropriated by the Board of Managers for the construction of the new Horticultural Garden entrance on the Southern Boulevard, and for the boundary fence adjoining this entrance. After approval of plans by the Municipal Art Commission, work was begun upon these structures in the autumn and by the close of the year they were essentially completed, with the exception of the iron railings needed, which it is hoped to obtain, at reasonable cost, during the winter or early spring.

This entrance to the Horticultural Garden is for pedestrians only; it consists of two piers built of cut cast stone; on one of these a suitable bronze tablet will be placed recording Mrs. Kingsland's gift. The boundary fence follows the design of those previously built on the Fordham University boundary and along the Bronx Boulevard, and will add about four hundred feet to the permanent fencing of the reservation.

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## CONFERENCE NOTES FOR NOVEMBER AND DECEMBER

The November conference of the Scientific Staff and Registered Students of the Garden was held in the laboratory of the museum building on Wednesday, November 3, 1920, at 3:30 P. M.

The program was as follows: "Intersexes in grapes" by Dr. A. B. Stout and "The genus *Veronica*" by Dr. F. W. Pennell.

Dr. Stout reported on the types of flowers in grapes with special reference to fruit development. The report was based on studies that are being made at the State Agricultural Experiment Station at Geneva, N. Y., in cooperation with the Horticultural Department of the Station. Here are grown many named varieties of European and American grapes which afford

material for a study of flower types in varieties whose performance in fruit production is well known. There are also several thousand seedlings blooming and fruiting that constitute 1st, 2nd, and 3rd generations of progenies from known parentage. These seedlings afford most excellent material for studies of variation in flowers and in fruit production and of the inheritance of sex in grapes.

The general survey of this material revealed at least one new type of flower, a wide range of variation in the length of stamens among flowers classed as staminate and as hermaphrodites, and various intermediates between the typically upright and the reflexed types. In breeding a plant exhibiting such variations in sex as are seen in the grape it becomes necessary to determine as fully as possible how various types of fruit may be produced. The breeder is concerned with understanding how the production of desirable types of flowers may be regulated, controlled, or influenced by breeding and by the selection of parentage.

This problem is especially being considered in respect to the production of seedless sorts. The studies indicate clearly that these are characterized by strong maleness and weak femaleness. The results of the breeding work already obtained at the Experiment Station indicate clearly that the use of seedless and near-seedless plants as male parents in crosses with varieties that are strongly female (perfect and imperfect hermaphrodites) gives progeny that are strongly female and seedproducing. The first generation of the hybrid offspring of many crosses of standard seeded varieties with Hubbard Seedless have all been strongly pistillate, yielding seeded fruits. Weak femaleness (seen in seedless fruits) is in this case dominated or swamped by the strong femaleness of the seed parent. However, the seeded character of the individuals of the first generation is no index of the variation in intersexes that may appear in later generations and the segregation of at least some plants bearing seedless fruits may be expected. The use of other seedless sorts in such crosses may, however, give different results.

The most effective course in breeding for the development of seedless sorts is suggested by the conditions of intersexualism. Most individuals and varieties producing seedless or near-seedless fruits are strongly staminate. The former can be used

as male parents on the latter which do produce a few viable seeds. Plants strongly male can be crossed with plants strongly male but weakly female and also the self-fertilized progeny of the latter may be obtained. In this way families weak in femaleness may undoubtedly be obtained in which a considerable number of individuals produce seedless fruits.

A more detailed discussion of intersexualism in the grape, with descriptions of the various types of flowers and with several plates of illustration will be published in the near future.

Dr. Pennell reviewed his recent study of the American species of *Veronica* and its near allies of the Scrophulariaceae. He discussed mainly the trend of evolution within the group.

One group, long held as a section, must be accorded generic rank. *Hebe* is a polymorphous genus of shrubs and even small trees, of New Zealand and southern South America, distinguished by having flowers localized in axillary racemes, and a capsule the septicidal dehiscence of which precludes its having been developed from that of the other "Veronicas."

*Veronicastrum* (*Leptandra*) is also considered a distinct small genus of eastern Asia and eastern North America. It is certainly an ancient type and the tubular corolla represents that from which the rotate corolla of the true Veronicas have developed. It is an erect, tall herb.

*Veronica* itself consists of low herbs, primitively perennial, erect, with opposite leaves, terminal racemes, five sepals and capsule not notched though even in the most primitive types it is already loculicidal. Tendencies from this are to plants annual, depressed and spreading, the leaves mostly alternate, the flowers localized in axillary racemes, the sepals four and the capsule strongly notched and bilobed. The chief cleavage is between the plants with flowers in generalized terminal racemes, Veronicella, and those with flowers in specialized axillary racemes, Euveronica or "true Veronica."

Dr. T. Harvey Johnston of the University of Queensland, Australia was present at the Conference and spoke very interestingly and instructively on his mission to the United States in connection with the work of the Prickly Pear Travelling Commission. Several species of cacti, commonly called prickly-pears, have escaped from cultivation in Australia, and have now become serious weed pests. They spread rapidly by both seed

and vegetative propagation and quickly occupy tillable land and even land under cultivation. Thousands of acres of agricultural and grazing lands are already covered with a growth of these cacti. The Government of Australia has established a Commission to consider means of control and extermination of this pest. The Commission has now been actively at work since 1914 and has decided that the most promising means of control is the destruction by natural enemies, especially by insects and fungi. A considerable number of natural parasites are known to be very destructive only to cacti and the Commission is now searching in many parts of the world for such parasites as are suitable for introduction into Australia.

The December conference of the Scientific Staff and Registered Students of the Garden was held in the laboratory of the museum building, on December 1, 1920, at 3:30 P. M.

The program was as follows: "*Siphocampylus* and *Centropogon* in South America" by Dr. H. A. Gleason. "The Genus *Diphysa*" by Dr. P. A. Rydberg.

Dr. H. A. Gleason reported on "*Siphocampylus* and *Centropogon* in South America." These two genera of Lobeliaceae are strictly American, with their center of distribution in northwestern South America, and extend south throughout tropical and subtropical South America. Northward they are distributed in smaller numbers as far as Mexico and through the West Indies. The species, about 400 in number, are beautifully characterized, mostly of local distribution, and probably represent recent and rapid evolutionary development. The two genera are distinguished by capsular and baccate fruits, respectively, but the two groups thus separated show such extraordinary parallelism that it seems probable that this character is not of generic value. A tentative separation has been made on the basis of corolla structure, by which four or five groups may be distinguished. The speaker's studies do not as yet warrant a decision as to the generic value of these characters. Most of the species are shrubs or vines with large, showy, brilliantly colored flowers. For this reason they early attracted the attention of botanists and horticulturists, and several species have been introduced into cultivation. The group as a whole appears to offer exceptional advantages for the correlation of geographic distribution with specific differentiation.

Dr. Rydberg reported on his work on the genus *Diphysa*, illustrating his remarks with specimens and sketches on the blackboard. The genus belongs to the family Fabaceae and to the tribe Galegeae and has usually been placed near *Robinia*. Dr. Rydberg thought that it was rather more closely related to a small group of genera clustered around *Sesbania*. This group consist of *Sesbania*, *Agati*, *Daubentonia* and *Glottidium*. In this group as well as in *Diphysa*, the structure of the corolla and the calyx proper is practically the same as in *Robinia*, but the fruits are quite different. In *Diphysa* as well as in *Sesbania* and its relatives, the calyx is substended by two bractlets which are wanting in *Robinia* and most genera of Galegeae. The fruit in *Diphysa* resembles that of *Sesbania* and its allies in this respect that the seeds are separated by a more or less distinct false partition, and is especially like that of *Glottidium* in that the pericarp separates into two layers of which the endocarp closely invests the seeds and the exocarp is thin and loose. In *Diphysa* the latter is strongly inflated and forms two elongate bladders, one on each side. *Diphysa* differs in another respect from both the Robiniianna and the Sesbanianeae in the presence of a well developed obconic hypanthium below the calyx. *Diphysa* has, as *Robinia*, odd-pinate leaves while in the Sesbanianeae the leaves are abruptly pinnate.

The type of *Diphysa* is *D. carthageniensis* described from Cartagena, Colombia. This is the most southern of the species. The genus ranges from Colombia to Arizona and has its best development in Southern Mexico. The most northern species was described by Dr. Gray as *Daubentonia Thurberi*. Its fruit has been unknown until recently. As the plant has odd-pinnate leaves and does not resemble much the known species of *Daubentonia* but more that of the Old World genus *Ormocarpum*, Hemsley transferred it to that genus. Dr. Otto Kuntze transferred it in one and the same publication both to *Emerus* and *Solueus* because he thought that the former name should replace *Sesbania* (including *Daubentonia*) and the latter *Ormocarpum*. The recently collected fruiting specimens show that the species is a true *Diphysa*, related to *D. racemosa*, but with narrower pod than the other known species.

A. B. STOUT
*Secretary of the Conference*

## NOTES, NEWS AND COMMENT

Under the benches in one of the orchid houses at Conservatory Range No. 2 is to be found a most interesting plant, *Dorstenia contrajerva*. This is a member of the mulberry family, and bears its flowers and fruit in a curious receptacle formed of the upper end of a long green scape arising from the crown. The structure is like a fig split open. A native of Tropical America, this plant seeds itself readily in our warm houses.

The second volume of "The Cactaceae," by N. L. Britton and J. N. Rose has recently come from the press. The first volume included two tribes, the Pereskieae and Opuntieae. This one embraces two more, the Cereanae of 38 genera, and Hylocereanae of 9 genera. It is a quarto of 239 pages with 40 plates and 305 text-figures. Published by the Carnegie Institution of Washington.

The Women's Auxiliary Board and the Board of Managers of the New York Botanical Garden will entertain the members of the Garden at the Waldorf-Astoria on the evening of February 8. The program will include short talks on various activities now in progress at the Garden.

Mr. Chas. C. Deam, State Forester of Indiana, widely known from his long and detailed studies of the Indiana flora, was a recent visitor at the Garden.

Mr. William W. Diehl of the United States Department of Agriculture, Washington, D. C., recently spent several days in mycological work at the Garden.

Professor C. R. Orton of Pennsylvania State College spent a few days in December at the Garden in continuation of his studies of certain fungi parasitic on grasses.

Dr. P. J. Anderson, of the Agricultural College at Amherst, Massachusetts, spent a few days at the Garden looking over the collections of cup-fungi preparatory to a monograph of the genus *Helvella* for his own state.

In the latter part of November, Dr. P. A. Rydberg made a visit to Washington to study the collections of Fabaceae, Carduaceae, and Solanaceae in the National Herbarium. This was done in connection with forthcoming monographs in the North American Flora. The trip lasted 10 days.

Dr. A. B. Stout, of the Garden Staff, served as a member of the Committee of Judges of the Mayor's Committee of Women

in judging the exhibits of paper white narcissus grown by children of the public schools of Manhattan. About 8,000 bulbs were distributed under the immediate direction of the Americanization Committee and grown under the supervision of the teachers. The entire exhibit, which was a most creditable one making a beautiful display of bloom, was assembled at P. S. 27 on December 9, for the general inspection by the public and that evening prizes were awarded and appropriate exercises held under the auspices of the Mayor's Committee of Women.

*Meteorology for November.*—The total precipitation for the month was 3.00 inches. The maximum temperatures recorded for each week were as follows: *71° on the 1st*, 62° on the 9th, 55° on the 20th, and 48° on the 23rd. The minimum temperatures were: 38° on the 4th and 6th, *23° on the 13th*, 34° on the 19th and 30° on the 29th. There were traces of snow on the 15th and 25th. First ice of the autumn formed across the middle lake on the 14th and 15th.

*Meteorology for December.*—The total precipitation for the month was 4.73 inches, of which 0.20 inches (2 inches snow measurement) fell as snow. The maximum temperature recorded for each week were as follows: 56° on the 5th, 51° on the 12th, *58° on the 14th*, and 54° on the 23rd. The minimum temperatures were 29 on° the 3rd, 24° on the 8th, 21° on the 20th, and *14° on the 26th.*

*Meteorology for the year 1920.*—The total precipitation at the New York Botanical Garden for the year was 46.61½ inches. This was distributed by months as follows: January, 2.59½ inches (including 7 and ¼ inches snow measurement); February, 4.17 inches( including 22 inches snow measurement); March, 3.16 inches (including 4 inches snow measurement); April, 4.23 inches; May, 3.13 inches; June, 4.04 inches; July, 3.68 inches; August, 7.49 inches; September, 5.01 inches; October, 1.38 inches; November, 3.00 inches, including traces of snow; December, 4.73 inches (including 2 inches snow measurement). The total fall of snow for the year was 35 and ¼ inches.

The maximum temperature for the year was 93° on the 11th and the 15th of June. The minimum was —4° on the 1st of February. The first freezing temperature of the autumn was in the morning of the 13th of November when 23° was recorded. The report of 19° on Sep. 20 printed in the November number

of the Journal is a typographical error; the record for that day was 39°. The latest freezing temperature in spring was on the morning of April 10th when the temperature of 24° was reached.

## ACCESSIONS

### PLANTS AND SEEDS

2 plants for conservatories. (Given by Mr. John Sommer.)
1 plant of *Heliconia Edwardus Rex.* (Given by Mr. W. B. Thompson.)
2 plants of *Acacia.* (Given by Mrs. F. A. Constable.)
1 plant of *Woodwardia.* (Given by Mr. H. W. Becker.)
6 plants of *Iris.* (Given by Thos. Meehan & Sons.)
4 plants of *Iris.* (Given by Mr. F. H. Horsford.)
2 plants of Everblooming Raspberry La France. (Purchased.)
18 grape plants. (Purchased.)
1 plant from Trinidad. (Collected by Mrs. N. L. Britton.)
2 plants of *Mamillaria prolifera.* (By exchange with Bro. Hioram.)
1 plant of *Mamillaria macromeris.* (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)
214 plants for conservatories and nurseries. (By exchange with Bureau of Plant Industry.)
4 plants of Cacti. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)
9 plants of *Castanea mollissima.* (By exchange with Bureau of Plant Industry.)
48 cuttings of *Populus tremuloides vancouveriana.* (Given by Mr. G. W. Chance.)
3 cuttings of *Saccharum officinarum.* (Given by Mr. G. W. Chance.)
2 plants of *Sequoia washingtoniana.* (Given by Miss Mary N. Welleck.)
7 plants from Florida. (Given by Mr. F. F. Hunt.)
4 plants of *Iris.* (Given by Elm City Nursery.)
3 plants of *Caltha palustris.* (Given by Miss M. E. Eaton.)
2 plants of *Chrysanthemum arcticum.* (Given by Mr. W. J. Matheson.)
34 plants from Florida. (Given by Mr. J. J. Soar.)
1 plant of *Trillium cernuum.* (Given by Mrs. L. M. Keeler.)
3 plants of Box Berberis. (Given by Elm City Nursery.)
12 plants for conservatories. (Given by Mrs. F. A. Constable.)
3 plants of *Dracaena.* (Given by Mr. H. W. Becker.)
2 plants for nurseries. (Given by Mr. W. W. Ashe.)
1 plant of *Helleborus viridis.* (Given by Mrs. Tysilio Thomas).
10 plants of *Iris cristata.* (Given by Mrs. O. A. Runyon.)
58 plants from Florida. (Collected by Dr. J. K. Small.)
47 plants from Trinidad. (Collected by Dr. N. L. Britton.)
1 plant of *Cocos nucifera.* (By exchange with Barnard College.)

28 plants of Cacti. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)

1 plant of *Robinia grandiflora*. (By exchange with U. S. Dept. Agric. Forest Service, through Mr. W. W. Ashe).

236 plants for conservatories. (Given by Mrs. H. A. Arnold.)

5 rose plants. (Given by Mr. J. P. Sorenson.)

5 plants for conservatories. (Given by Mr. John Sommer.)

72 plants for pinetum. (Purchased.)

3 plants of *Opuntia*. (By exchange with Mr. J. P. Otis.)

59 plants of *Penstemon*. (Collected by Dr. F. W. Pennell.)

1 plant of *Bryophyllum pinnatum*. (By exchange with Dr. Walter Mendelson.)

11 plants of Cacti. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)

1 plant of *Tripsacum laxum*. (By exchange with Univ. of Indiana.)

196 plants derived from seeds from various sources.

203 Dahlia roots, 76 varieties. (Given by Dr. M. A. Howe.)

88 Dahlia roots, 81 varieties. (Given by Mr. W. J. Matheson.)

62 Dahlia roots, 31 varieties. (Given by Dahliadel Nurseries.)

32 Dahlia roots, 31 varieties. (Given by Mr. Alfred E. Doty.)

47 Dahlia roots and plants, 24 varieties. (Given by Mills & Co.)

24 Dahlia roots and plants, 24 varieties. (Given by Mr. C. Louis Alling.)

30 Dahlia roots and plants, 19 varieties. (Given by MissEmilySlocombe.

27 Dahlia roots and plants, 19 varieties. (Given by Mr. J. J. Broomall.)

22 Dahlia roots, 22 varieties. (Given by Mr. Geo. L. Stillman.)

18 Dahlia roots, 10 varieties. (Given by Mr. Richard Vincent, Jr.)

19 Dahlia roots, 19 varieties. (Given by Mr. J. K. Alexander.)

25 Dahlia roots, 11 varieties. (By exchange with Mr. Edwin Marquand.)

23 Dahlia roots, 19 varieties. (Given by Mr. H. McWhirter.)

14 Dahlia roots, 14 varieties. (Given by Mr. F. C. Burns.)

11 Dahlia roots, 6 varieties. (Given by Mrs. Chas. H. Stout.)

15 Dahlia roots, 5 varieties. (Given by Miss Annie Lorenz.)

7 Dahlia roots, 7 varieties. (By exchange with Mr. L. H. Bubois.)

8 Dahlia roots, 7 varieties. (Given by N. Harold Cottam & Son.)

14 Dahlia roots, 14 varieties. (By exchange with Dr. W. A. Orton.)

3 Dahlia roots, 3 varieties. (By exchange with Garden Club of Ridgwood, N. J.)

3 Dahlia roots, 3 varieties. (By exchange with Mr. F. P. Quimby.)

28 Dahlia roots, 19 varieties. (By exchange with Mr. Joseph Smith.)

18 Dahlia roots, 3 varieties. (Given by Frank D. Pelicano & Co.)

2 Dahlia roots, 2 varieties. (By exchange with Mr. C. Frey.)

6 Dahlia roots, 6 varieties. (By exchange with Mr. Robert B. Goeller )

1 Dahlia root. (Given by Mr. Joseph Pfluger.)

3 Dahlia roots, 3 varieties. (Purchased.)

1 Dahlia root. (By exchange with Miss Rosalie Weikert.)

1 plant of Begonia. (Given by S. C. Templin & Son.)

112 plants of *Iris*. (Given by Miss Grace Sturtevant.)

303 plants of *Iris*. (Given by Mr. John C. Wister.)

1 plant of *Iris*. (Given by Mr. F. H. Presby.)
1 plant of *Portulaca pilosa*. (Collected by Mr. Kimball.)
19 plants of Cacti for conservatories. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)
5 bulbs of *Validallium tricoccum*. (Given by Dr. H. H. Rusby.)
56 plants derived from seeds from various sources.
26 plants of *Iris*. (Given by Mrs. C. S. McKinney.)
1 plant of *Rumex alpinus*. (Given by Miss E. M. Kittredge.)
3 plants of *Iris*. (Given by Mrs. O. A. Runyon.)
3 plants of *Persea*. (Given by Mr. D. S. Dark.)
2 plants of *Talinum Mengesii*. (Given by Mr. Bede Knapke.)
59 plants of *Iris*. (Given by Miss Grace Sturtevant.)
1 plant of *Iris*. (Given by Mrs. E. M. Sanford, through Mrs. C. S. McKinney.)
14 plants for nurseries. (Collected by Dr. J. K. Small.)
4 plants of *Acer pennsylvanicum*. (Collected by Dr. E. B. Southwick.)
10 plants of Cacti. (Collected by Dr. J. K. Small.)
1 plant of *Commelina*. (Collected by Dr. F. W. Pennell.)
2 plants of *Opuntia*. (Collected by Mr. R. L. Barney.)
2 plants of *Opuntia*. (Collected by Dr. J. K. Small.)
3 plants of Cacti. (By exchange with U. S. Nat. Museum, through Dr J. N. Rose.)
6 orchid plants. (By exchange with U. S. Nat. Museum, through Mr. Wm. R. Maxon.)
1 plant of *Cereus*. (Given by Mr. E. W. Poole.)
1 plant of *Iris*. (Given by the Crawford Garden.)
39 plants of *Iris*. (Given by Mr. C. H. Hall.)
6 plants of *Iris*. (Given by Mr. J. T. Lovett.)
57 plants of *Iris*. (Given by Mr. Willis E. Fryer.)
8 plants of *Iris*. (Given by Mrs. Ella F. Rockwell.)
15 plants of *Iris*. (Given by Peterson Nursery.)
2 plants of *Iris*. (Given by Mr. E. M. Buechly.)
43 plants of *Iris*. (Given by Mr. T. M. Fendall.)
16 plants of *Iris*. (Given by Mrs. Azno Fellows.)
30 plants of *Iris*. (Given by Mrs. C. S. McKinney.)
8 plants of *Iris*. (Given by Mr. H. P. Sass.)
12 plants of *Iris*. (Given by W. J. Engle & Son.)
160 plants derived from seed from various sources.
3 plants of *Iris*. (Given by Mr. Wm. S. Johnson.)
30 plants of *Iris*. (Given by Mrs. W. S. Rait.)
4 plants from Pennsylvania. (Collected by Dr. F. W. Pennell.)
1 plant of *Lacinaria scariosa*. (Collected by Mr. Percy Wilson.)
5 plants from Pennsylvania. (Collected by Dr. J. K. Small.)
8 plants of Cacti for conservatories. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)
5 bulbs for conservatories. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)
68 plants for conservatories. (By exchange with Prospect Park.)

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The contribution of $25,000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a benefactor of the Garden.

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The contribution of $5000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a patron of the Garden.

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Sustaining members pay from $25.00 to $100.00 annually and become fellows for life when their payments aggregate $1000.00.

## 6. Annual Members

Annual members pay an annual fee of $10.00.
All members are entitled to the following privileges:

1. Tickets to all lectures given under the auspices of the Board of Managers.
2. Invitations to all exhibitions given under the auspices of the Board of Managers.
3. A copy of all handbooks published by the Garden.
4. A copy of all annual reports and Bulletins.
5. A copy of the monthly Journal.
6. Privileges of the Board Room.

## 7. Life Members

Annual members may become Life Members by the payment of a fee of $250.00.

## Information

Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

## Form of Bequest

**I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....**

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# JOURNAL

OF

# The New York Botanical Garden

EDITOR

R. S. WILLIAMS

*Administrative Assistant*


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In shore hammock on Terra Ceia Island. *Harrisia aboriginum* in foreground; hammock-jungle in background. The cactus plants are usually fifteen to twenty feet tall, and commonly much branched. They grow in a soil composed of shells piled up by the aborigines and sand blown in from the bay. In addition to these ingredients, in some places the fossil remains of the aborigines are abundant. The cactus is particularly interesting, as it is the only one this side of the Gulf Stream with brown-haired flowers and yellow fruits.

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# OLD TRAILS AND NEW DISCOVERIES

## A RECORD OF EXPLORATION IN FLORIDA IN THE SPRING OF 1919

*With Plates 253 and 254*

Exploration of new and little-known parts of Florida which had so greatly enriched our knowledge of the *Opuntiae* thereabouts in recent years, convinced the writer that there was also much more to be learned in that State than was known prior to 1918, concerning the cacti of the *Cereus* group. His attention was directed especially to the genus *Harrisia*, for there was evidence of its occurrence in many parts of both the southern half of the Florida peninsula and on the keys. As this evidence had a timely importance, moreover, in view of the monograph of the genus *Harrisia* contemplated by Doctors Britton and Rose, it was deemed worth following up without delay. We therefore organized a cactus-hunt. The Board of Scientific Directors of the Garden approved. Mr. Charles Deering, to whom we are already so deeply indebted, once more put launch and automobile at our disposal for the field-work. And it is thus that we are able to make the following report on botanical exploration of Florida in the early months of 1919.

We were enroute for Miami, Florida, the last week in April. The season in the North was backward; but, even so, the shrubs and trees had begun to don their green, either singly or en masse; various water-plants, both broad-leaved and narrow, were expanding their foliage above the surface of the ponds and streams; and many flowers were in evidence all along the way.

Among our native shrubs in bloom, the spice-bush (*Benzoin*) and the shad-bush (*Amelanchier*) were conspicuous, while the cultivated trees were conspicuously represented by the apple (*Malus*), the pear (*Pyrus*) and the peach (*Amygdalus*). The herbaceous plants that attracted the eye readily along the way in their respective habitats were bloodroot (*Sanguinaria canadensis*), buttercups (*Ranunculus*), fire-pink (*Phlox subulata*), may-apple (*Podophyllum peltatum*), false meadow-rue (*Syndesmon thalictroides*) and various naturalized weeds that grew in cultivated fields and along the fence rows.

South of Philadelphia, and particularly south of Washington, vegetation appeared much more advanced. There, for several hundred miles, the Japanese honeysuckle (*Nintooa japonica*) was the naturalized plant most in evidence. This often much-abused vine seems to be excellent for holding sloping roadsides and railroad embankments; and, in addition to being evergreen or nearly so, it usually has a quite continuous flowering season, or several flowering seasons, except in mid-winter.

In western Delaware, pine trees had appeared; first the poverty-pine (*Pinus virginiana*), then the pitch-pine (*Pinus rigida*). The most conspicuous evergreen shrub accompanying these in the fall-line hills of Maryland was the calico-bush or mountain-laurel (*Kalmia latifolia*). Although not in flower, the numerous deep-green leaves, of the same fresh glossiness all the year round, made the plant notable. Thence, on down into Florida, one may observe not less than seven additional kinds of pines, or nine kinds altogether. It was always striking, where pine trees and broad-leaved trees grew associated, to see how different were the greens they presented—the greens of the broad leaves so bright and, as one might say, joyous; those of the pines so dull and sombre.

In Virginia and the Carolinas spring had progressed apace. Here meadows and pastures often supported so copious a growth of dandelions (*Leontodon Taraxacum*) that the myriads of flower heads suggested a carpet of gold; while other pastures were so thickly overgrown with a winter-cress (*Barbarea*) that, because of the particular yellow of its flowers, they seemed sheathed in brass. Also there were old fields here and there that seemed to be covered with a bluish mist, an optical illusion, caused by the myriads of the small blue flower of the toad-flax (*Linaria canadensis*).

Thus we took a fleeting wild-flower census: violets (*Viola*), dewberries (*Rubus*), phlox (*Phlox*), wild-strawberries (*Fragaria*), pitcher-plants (*Sarracenia*), fleabanes (*Erigeron*), bladderworts (*Utricularia*), Virginia-cowslip (*Mertensia*), sneeze-weed (*Senecio*), flags (*Iris*), beard-tongues (*Pentstemon*), false-indigo (*Baptisia*). These were the more conspicuous. But also the woods were gay with dogwood (*Cynoxylon*), sweet-bay (*Magnolia*) and viburnums. Here, too, the ground was covered, often by the acre, with a beautiful white or pinkish azalea usually not more than a foot tall.

That old favorite of the South, the cultivated China berry (*Melia Azaderach*), was in bloom; and curiously enough, several weeks later I found it in the same condition in tropical Key West.

Nor were the palms wanting in this plant panorama, once we were in South Carolina. First we saw palmetto (*Serenoa serrulata*), then the blue-stem (*Sabal Adansonii*), and finally the cabbage-tree (*Sabal Palmetto*). With the exception of the needle-palm (*Rhaphidophyllum Hystrix*), the above-mentioned palms represent all the kinds that are found north of peninsular Florida. In Florida, however, nine other kinds grow naturally, these often represented by countless individuals.

Two interesting conditions were observed in passing through the various swamps. First: in the numerous swamps away from rivers, the early flowers of the spatterdock or bonnets (*Nymphaea*) and the water-lily (*Castalia*), seemed to be smaller than the later flowers, a condition usually, if not always, the reverse with our common herbs, where the early flowers are found conspicuously larger than the succeeding ones. Second: in the river swamps or bottoms, or the dry or partly dry plain between the river and the former banks of the river, at ordinary low water, hickories (*Hicoria*), oaks (*Quercus*), gums (*Nyssa*), maples (*Acer*), and elms (*Ulmus*), as well as the cypress (*Taxodium*), all develop conical bases or buttresses, evidently so as to make a more extensive root system for anchorage in the alluvium, particularly in seasons of high water.

Also, in depressions in the districts of little elevation, we observed groups of trees of the black-gum (*Nyssa biflora*) similar to those of the pond-cypress (*Taxodium ascendens*) in similar situations called cypress-ponds. The ponds with these dis-

tinctive groups of gum-trees may be called "gum-ponds." An investigation of their flora would doubtless be interesting.

The most attractive spring-flowering plant in all the swamps is the native wisteria (*Kraunhia frutescens*). This is a woody vine that climbs into the shrubs and trees and bears numerous drooping clusters of beautiful blue flowers. This species and another, which occurs in the Mississippi Valley, are the only representatives of the genus in the New World. The other species occur in eastern Asia.

With northern Florida, the chromatic scale and seasonal sequence of "the flowers that bloom in the spring" came to an end. The Florida flat-wood and the minor plant-regions have rather little to show, at a distance at least, with the changes of the season and latitude.

We reached Miami during the last week of April. The greater part of May was spent in the field. I was accompanied by Mrs. Small, who cared for the herbarium specimens incidentally collected. With the permission of Dr. David Fairchild, we established our field-headquarters in the laboratory building of the Plant Introduction Garden of the United States Department of Agriculture, in Miami.

Experience in the field and information gathered from time to time indicated five promising regions in Florida for discoveries in the genus *Harrisia:* (1) the sand-dunes along Saint Lucie Sound; (2) the islands of Tampa Bay; (3) the Cape Sable region, including the Madeira Bay district to the east and the Ten Thousand Islands to the north; (4) the Upper Florida Keys; (5) the Lower Florida Keys.

We took the field almost immediately after reaching Miami, and thereafter our active field-day, both on land and on water, almost invariably lasted from sunrise to midnight.

## Miami and Terra Ceia Island

We first set out for the mouth of the Manatee River, our objective being Terra Ceia Island in McGills Bay. Our course lay along the eastern coast of the State as far north as either Jupiter or Fort Pierce. Various plant associations were traversed over this course.

First, the pine-woods are dominant. Of course, creeks with their bordering hammocks or prairies were crossed from time to time.

Then, north of the settlement of Hallandale, the "scrub" appears. This plant association occupies a formation of almost snow-white sands which are evidently ancient, now stationary, dunes. The southernmost dunes are low and nearly flat, but northward they become more undulating, and finally a few miles north of West Palm Beach, become conspicuous hills. Yet, to one's great surprise, among these hills, which attain a considerable elevation for that region, are situated a number of large cypress heads, some of which extend nearly or quite to the coast.

The characteristic tree of the "scrub" is the spruce-pine (*Pinus clausa*), but in its southern extension one finds a mixture of the Caribbean-pine or slash-pine (*Pinus caribaea*) and the sand-pine, or sometimes the Caribbean-pine exclusively. The conspicuous shrubs of the "scrub" are the saw-palmetto (*Serenoa serrulata*), the rosemary (*Ceratiola ericoides*), the prickly-pear (*Opuntia ammophila*), a heath (*Xolisma speciosa*), and scrub-oaks (*Quercus*). Various, but not numerous, herbs, both coarse and delicate, are associated with the shrubs, and vines are present. Among the latter a parasite (*Cassytha*), resembling the dodder in habit and color but really related to the laurels, is by far the most conspicuous. It commonly grows so luxuriantly that it actually smothers the shrubs, sometimes over large areas.

In the marshes among these dunes, and in and about the ponds, there was an abundance of aquatic and semiaquatic plants chiefly with yellow flowers. A score of yellow-flowered plants might be mentioned to one showing a different hue. One of the more conspicuous, although in no way showy plants was a tall sedge (*Dichromena latifolia*). This grew scattered or in colonies. The stalk was inconspicuous or invisible from a distance; but the whorls of long ghostly-white bracts at the top of the stalk were very conspicuous and suggested, especially toward dusk, so many little will-o'-the-wisps. It is one of the few sedges in which fertilization is accomplished through the agency of insects.

The old settlement of Jupiter, eighty-three miles north of Miami, was soon reached. There we had to decide whether we would strike out for the Okeechobee region over the old Fort Bassinger trail which was used during the Seminole Wars,

or drive further north to Fort Pierce to enter the Okeechobee country. Inquiries not bringing forth any definite information, as usual, we decided, as we had already been over the Fort Pierce route, to try the Fort Bassinger trail, with Okeechobee City fifty odd miles to the northwest and Fort Bassinger about twenty miles further on along the Kissimmee River.

For the distance of a few miles the trail had been improved by surfacing the more or less improved grade. We passed beyond the "scrub" and the high pinelands, then crossed some streams with rich bordering hammocks.

We now approached "Hungry Land," so-called, they say, because a herd of stolen cattle were here penned up and allowed to starve, when the frightened thieves fled. But, in any case, it is well named. It is a desolate region east of the Saint Lucie slough; not like the general surface of the earth, one-third land and two-thirds water, but—well, to be charitable—say half land, half water. The more conspicuous plant associations were cypress-swamps, ponds, prairies, and low pine woods.

The ponds were partly dried up, but only to be so for a few days, as will be noticed on a subsequent page. Most of them, both as to the dry edges and the shallow water, supported a marvelously copious growth of the erect bladderwort (*Stomoisia juncea*). Acre after acre was almost a pure growth of the plant, inconspicuous in itself, but very conspicuous in such masses.

Another phenomenon that attracted our eye particularly was the numerous small pine trees, two or three years old, springing up among the cypress trees in the cypress swamps. They seemed out of place. Perhaps the lowering of the general water-table, consequent upon the decided lowering of the water of Lake Okeechobee, has brought about conditions permitting these pine trees to grow where formerly it was too wet.

After several hours in Hungry Land we came to the Hungry Land slough, which seems to represent the boundary line between two geological formations, namely: the Palm Beach Limestone and the Pleistocene. This slough, with its extensive hammocks, geographically separates Hungry Land, which lies between it and the Atlantic Ocean, and the Allapattah Flats, which lie between it and Lake Okeechobee.

We crossed the slough, which has lately been dredged as part of the Saint Lucie Canal, on a ferry, and entered the Allapattah Flats. Here the ground soon became noticeably higher than that of Hungry Land, and the landscape was enlivened with bush clovers (*Petalostemon*), devil's shoe-strings (*Galactea*), thyme (*Pycnothymus*), grass-pinks (*Sabbatia*), asclepiads (*Asclepiadora*), bonesets (*Eupatorium*), goldenrods (*Solidago*), asters (*Aster*), and thistles (*Cirsium*).

These "flats" have long been a rendezvous for the Cow Creek Indians and we soon could discern many camps in the distant pine wood towards the west and an occasional Indian walking, or riding on horseback through the woods. The land continued to rise and the pine trees became more scattered. Then open stretches appeared, and, finally, the trail led out to an extensive prairie. Far to the west we saw a long, evidently tall hammock, but in this flat country one would have almost sworn that this was a range of hills.

We had not time to stop for an examination of the flora of the prairie, but two shrubs were particularly noticeable. Parts of the prairie were covered with a dense growth of the wax-myrtle (*Cerothamnus*), the bushes ranging from one to three feet tall. Other areas were covered with a small oak, usually only six to ten inches tall—this lack of visible development probably made up for by an extensive growth underground.

At a fork in the trail we decided to take the left hand or westerly branch, as it seemed to lead toward the distant hammock. Although we had several times seen this hammock from the other side and had been in it, its identity at this time did not dawn upon me. On approaching it we saw that the trail led through it. When part way through the timber we could look beyond the cut into space, and a little further on a vast sheet of water appeared. It was Lake Okeechobee! We drove out onto a beach which only a few years ago was still the bottom of the lake. More than that, we were soon actually driving over the very course we had sailed over five years previously[1] in a forty-five foot cruiser!

But how much everything had changed since that time! Instead of a natural beach close to a primeval hammock, we

[1] Journal of the New York Botanical Garden **15**: 69–79. 1914.

found several hundred yards of exposed new weed-clothed lake bottom, down from the old beach line; and as for the ham mock, it was wrecked. Fire had been in it, perhaps more thai once; and, in many places, instead of the once magnificen verdure, one saw only dead giant cypress trees, standing deso late, or prone in the wholly or partly burned humus where once had thrived an almost impenetrable mass of ferns anc other herbaceous plants.

Sixteen miles over the former lake-bottom and through a portion of the destroyed hammock brought us to Okeechobee City.

Early the following morning we set out for Bradentown nearly two hundred miles further on. We continued on the Fort Bassinger trail to the Kissimmee River, and thus on to Fort Bassinger itself, a course we had already traversed in the opposite direction one night last December.[1] Covering it in daylight, however, gave us quite a different impression of the region. The scattered pine trees north of Lake Okeechobee soon gave way to open prairie flanked in the far distance by pine-woods or hammock, east and west. The higher parts of the prairies were mostly grass-clothed, while the lower portions were clothed with almost a pure growth of flag (*Iris*) as far as the eye could see. The flags were mostly past flowering and bore clusters of cucumber-like capsules, the weight of which had borne the weak flower-stalks to the ground.

Seldom did the trail fail to yield something of interest. About half-way to Fort Bassinger we passed a cypress-head which served as rookery for a flock of wood-ibis, and many of these beautiful birds were roosting on the trees, shining whitely against the shadows.

It was midway to the Kissimmee River that growth of scattered pine trees, small cabbage-tree hammocks, and live-oaks appeared, albeit the land continued low. Further north there was an extensive growth of myrtle (*Cerothamnus*), gallberry (*Ilex*), heath (*Xolisma*), and scrub-oak (*Quercus*), as well as considerable turf. On approaching the Kissimmee we found curious circular areas of saw-palmetto (*Serenoa serrulata*) and

[1] Journal of the New York Botanical Garden **21**: 25-38, 45 54. 1920.

small persimmon trees (*Diospyros Mosieri*)[1] ,and groves of live-oaks that looked almost like apple-orchards.

Then after crossing the wide flood plain of the Kissimmee we came to the shallows and blind channels of the river. These were choked or carpeted with dense growths of aquatic grasses (*Panicum*), pond-weeds (*Potamogeton*), naiads (*Naias*), and arrow-heads (*Sagittaria*).

The settlement of Bassinger lies east of the Kissimmee, while Fort Bassinger proper, of Seminole War times, was on the western side of the river.

Crossing the river west of Bassinger, we left the Okeechobee prairie and were soon on the Istokpoga prairie, traveling east and north of Lake Istokpoga, a little-known body of water about ten miles in diameter. We then crossed Istokpoga Creek, which connects the lake of the same name with the Kissimmee River, and is apparently the only outlet of the lake. It is lined with beautiful hammocks. The dense hammock about Lake Istokpoga itself, plainly visible in the distance, is a botanical storehouse, as yet wholly unexplored. We do not even know whether its arboreous growth is coniferous (cypress) or broad-leaved, or both. After circling many miles toward the west and crossing a creek flowing from Lake Arbuckle into Lake Istokpoga, we met the pine woods again.

A meandering trail soon led us to a most insignificant stream apparently, but this stream proved to be the boundary between two conspicuously distinct geological formations; for thence the trail entered immediately a series of curious old sand-dunes wholly unlike the lands we had left. These dunes ran in somewhat parallel ridges, now close together, again separated by extensive "parks"; and the sand, although snow-white and loose, supported a veritable flower garden. In general, the region forms a watershed, the streams on the eastern

[1] **Diospyros Mosieri** n. sp. A tree seldom as large as *D. virginiana* or commonly shrub-like; differs from *D. virginiana* in the smaller flowers, the staminate only about one-half as large, the short and broad calyx-lobes, the stouter stamens, and the short, broad, turgid seeds. The type specimens were collected in pine woods near the Humbugus Prairie, west of Little River, Florida, in fruit, by J. K. Small, C. A. Mosier, and G. K. Small, No. 6927, July 8, 1915; in dead ripe fruit, by C. A. Mosier, November 1917, and in flower, by J. K. Small, April 1920.

side flowing into the Okeechobee basin, those on the western side forming tributaries of the Pease River. Curiously enough, the backbone of this plateau has a chain of large and small lakes on it, the magnet of several settlements.

After crossing a series of other ridges we came to Sebring. Thence we traveled northward on the plateau to Avon Park. Another leg of our course westward brought us into the valley of the Pease River at Zolfo Springs.

In the intervening country we found small forests of the persimmon in full flower. South of Zolfo Springs terrestrial orchids (*Limodorum Simpsonii* and *Gymnadenopsis nivea*) appeared in the marshes for the first time since we left the eastern Okeechobee region. As for the pine woods, the conspicuous plant here was a curious yellow-flowered legume called *Chapmania*. This has a deep-seated, woody root and a slender wand-like stem, bearing yellow flowers whose petals do not at first sight suggest a papilionaceous corolla at all. It was named for Dr. A. W. Chapman,[1] long a resident of Florida, and the first botanist to construct an interpretation of the flora of the southeastern United States. The hammocks of the valley were fragrant with the sweet-bay (*Magnolia virginica*) and numerous herbs and shrubs were in bloom, notably the tall blackberries (*Rubus*) and the wild purple leather-flower (*Viorna crispa*). Following the valley southward for about twenty miles, we arrived at Arcadia.

Although we had traveled many miles to the west, we were still over forty miles in a bee-line from the coast of the Gulf of Mexico. Incidentally, the intervening country is essentially unsettled and is accessible by a very poor trail.

We soon crossed the Pease River and once again struck into the wilderness. Two settlements are on the trail between the Pease River and Sarasota on the Gulf, according to the map,

[1] Alvan Wentworth Chapman (1809-1899) was a graduate of Amherst College who went to Georgia as a teacher, studied medicine there, and soon afterward entered upon the practice of his profession in Florida. For more than half a century his home was at Apalachicola, where he died in his ninetieth year. His "Flora of the Southern United States," first published in 1860, and running through several editions, was for nearly fifty years the only manual of the flowering plants of the southeastern states.—JOHN HENDLEY BARNHART.

but these are barely visible to the naked eye. The region is wild and lonely, bisected by the Myakka River with its wide prairies. On either side of the prairies are unpeopled pine woods. And through all of this runs a trail that is mostly sand, sand that is very loose and often deep. The sand was various in color; and there, instead of the snow-white sand formi g ridges, it filled the low places. But all of it was hard to travel through. At many places, to use the language of the country, our motor seemed "powerful weak." Still, we did manage to crawl along. Night was coming on.

Several miles beyond the tiny settlement of Myakka, when it was dark, we found that we had missed the trail and that we were on some sort of an indigenous branch trail, so common to the country. Perhaps the branch would lead back into the main trail, as branches often do. We continued. It was very dark, but the stars were out. By the stars we could tell that we were traveling not west, toward our destination, but south into a still more savage wilderness. We persevered, and at last were rewarded, or so we thought, by seeing several bright lights to the westward, then yet another branch trail that would lead us there.

But our lights—alas!—merely betokened a forest fire.

The fire was extensive. It had curiously run into about a dozen lines, and each of these lines cut the trail with a hurdle of flame. But we could not, or would not, turn back. We took some photographs, then beat out enough of the flame to make a safe passage for our extra supply of gasoline, and went ahead.

Several miles of meandering through the dark woods brought us eventually back into the main trail, and thus, in due time, other and less sinister lights appeared ahead. They were the lights of Sarasota. After that, plain sailing, the highway to Manatee, another's hour's run, and we were in Bradentown, our objective. An eleven o'clock supper, then bed.

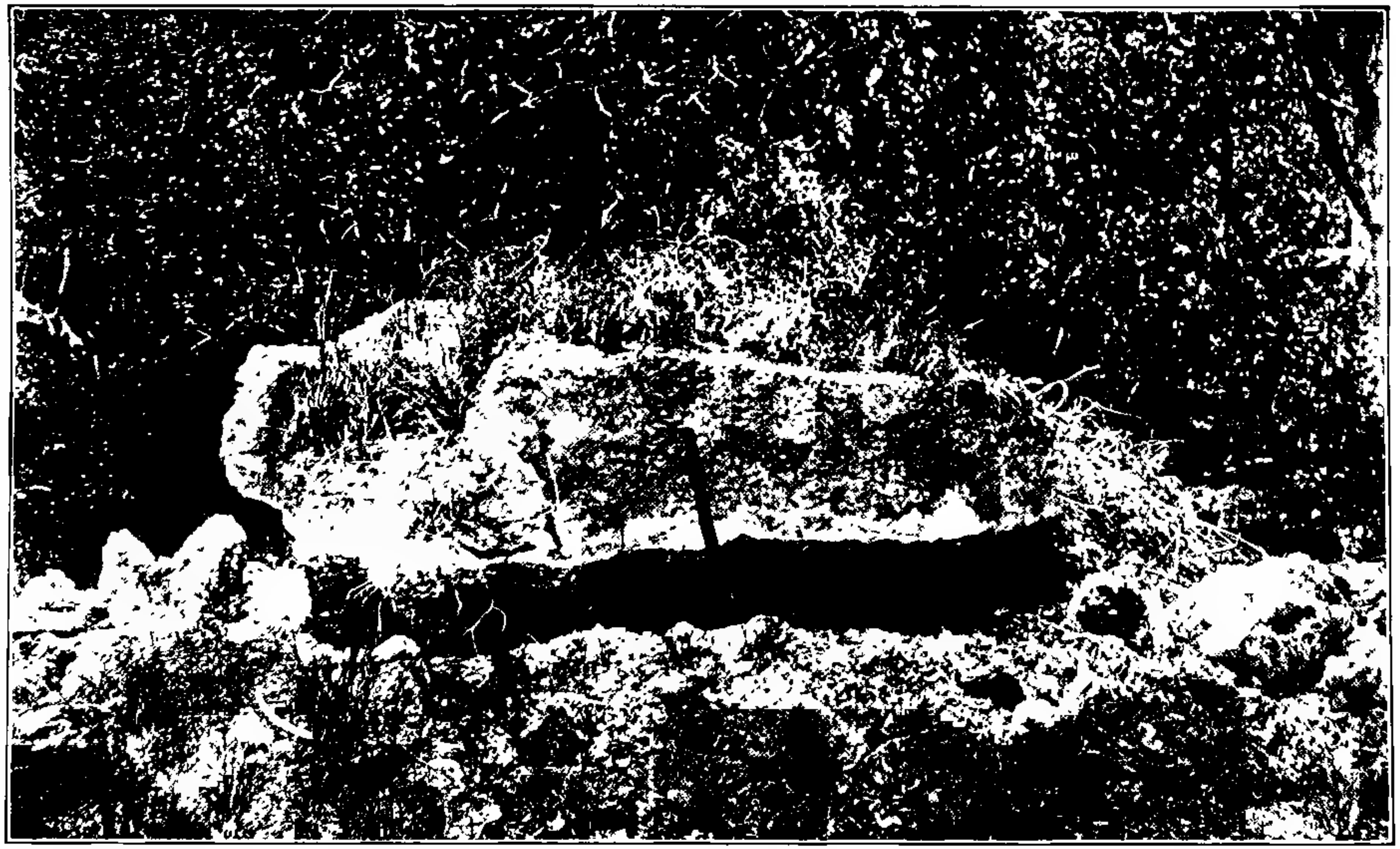
According to prearranged plans, the following morning found a motor boat ready to carry us to McGills Bay and Terra Ceia Island. Before we started we were joined by Mr. Alfred Cuthbert, who generously entertained us during our stay in that part of the country.

Cactus plants, an abundance of prickly-pears (*Opuntia Dillenii* and *O. austrina*), came into evidence as soon as we landed on Terra Ceia Island, but these were not what we sought. While wandering about in the woods we came upon a cabin, and a girl who lived there said she thought we would find other cacti further up the shore. Also, she volunteered to guide us past the "dead bodies" in the trail! We followed. The bodies were there, sure enough, but only skeletons, happily. They were the fossil remains of aborigines dug from a shell midden in making a drainage ditch.

Terra Ceia Island itself is a vast kitchen-midden, or ancient artificial shell heap, built up by the former inhabitants with their discarded oyster, clam, and conch shells. The bones we saw, evidently strongly impregnated with lime, were in a good state of preservation. The skulls were particularly interesting. Many of us have been taught that a diet of sea-food, particularly develops the brain. Now these ancient people lived largely, perhaps wholly, on fish and "shell-fish"; but from what we know of their history they were not intellectual giants. Their diet did evidently develop their heads, however. The skull-bones of the specimens we observed varied from one-half an inch to nearly three-quarters of an inch in thickness.

After this venture in archaeology, we broke into the hammock at several points and soon found our prize, a tall columnar night-blooming cactus with stout stems growing to a height of twenty feet. It proved to be a new species of *Harrisia*,[1] differing from all the other known Florida kinds in having brown wool and yellow fruit, the other kinds having white wool and red fruit. Fortunately, we secured one flower-bud about to open and one ripe fruit. The fruit was mailed directly to the Garden for painting, while the bud was taken to Mr. Cuthbert's house, where we sat at the festive board from six o'clock till midnight, shortly before which the bud opened and we secured a description of the flower. More closely than in any of the other Florida species, the flower-limb resembles the expanded flower of a water-lily.

[1] This species was named for the prehistoric inhabitants of that region, *Harrisia aboriginum*, and published in THE CACTACEAE **2**: 154. 1920.



On Punta Blanca at mouth of the Caloosahatchie. Fire-place of the aborigines in foreground; dense hammock in background. The original surface of the kitchen-midden was as high (about four feet) as the top of the rock, the remains of the fire-place. The loose material, mainly shells and fossil skeletons of the aborigines, was removed for road-making. Continuous fires of generations burned the shells and the action of the elements concreted the residue into a solid mass of lime. Since their disuse by the natives the shell heaps have become covered by a dense hammock-

A botanical survey of Terra Ceia Island would doubtless prove interesting in other respects. Its flora has more tropical elements than any of the neighboring islands. It is probably the northern limit of the Gumbo-limbo (*Elaphrium Simaruba*) on the western coast, which species is represented there by a group of very large trees. Armed shrubs were much in evidence. The cat's-claw (*Pithecolobium*), the wild-lime (*Zanthoxylum*), the nicker (*Guilandina*), the devil's claws (*Pisonia*), the prickly-pears already mentioned, and other spiny plants often made the hammocks almost impenetrable.

Having accomplished our purpose we set out for headquarters, Miami, early the following morning. Instead of returning by the route we had just been over, however, we set out in the opposite direction, heading for the Tampa region. One reason for our selection of this route was a possible visit to the fern-grotto described in a former paper,[1] and which should have an interesting spring flora, besides being a remarkable fernery. But after driving north of Plant City for several miles we found the highway in such abominable condition that lack of time forced us to abandon this itinerary. Somewhat discouraged, we turned back and started through the southern end of the lake region.

West of Plant City we observed several ridges of "scrub." East of it were hammocks with oaks (*Quercus*), hickories (*Hicoria*), and red-gum (*Liquidambar*), prominently developed. Of course, there were pine woods and a mixture of pine woods and oak woods.

Evening found us again at Avon Park, which is situated in a very interesting floral region.

One locality just west of the town attracted our attention particularly. It was a park-like area between hills. The ground was thickly covered with an intermingled mass of a morning-glory (*Stylisma*) and toad-flax (*Linaria floridana*). The conspicuous shrubs at the height of their flowering season were a large-flowered prickly-pear (*Opuntia ammophila*) and the largest-flowered papaw (*Asimina obovata*). The adjacent hills were, moreover, in places yellow with the numerous flowers of a rare false-indigo (*Baptisia LeContei*).

[1] Journal of the New York Botanical Garden **21**: 25–38, 45–54. 1920.

The following morning we continued our journey eastward and soon came to the crest of the sand-plateau referred to in a preceding page. There we made our first extended stop for collecting miscellaneous plants. The pine of those ancient dunes was not the spruce-pine (*Pinus clausa*), the normal tree of such dunes, but the long-leaf pine (*Pinus palustris*). The broad-leaved trees were mostly represented by the turkey-oak (*Quercus Catesbaei*) and a kind of hickory (*Hicoria*). Shrubs were more numerous than trees, both in kinds and quantity. In this category may be mentioned the scrub-plum (*Prunus geniculata*), our smallest and latest discovered eastern plum, at this time not only past the blooming season, but also without fruit. Associated with the plum was a curious kind of titi (*Cyrilla*) just coming into flower. The only two genera of the Yucca family east of the Mississippi River were represented by *Yucca filamentosa* and *Nolina atopocarpa*. Dozens of different kinds of herbs were in full flower with a great range of colors, but the most showy plant, both in quantity and color, was the blue lupine (*Lupinus diffusus*). This plant was in evidence everywhere in high pineland and was particularly conspicuous on account of its silvery foliage and sky-blue flowers. The most interesting vine of the sand-hills was the small bullace-grape or muscadine (*Muscadenia Munsoniana*). This widely distributed grape of southern Florida usually has leaves from two up to four inches in diameter, but the plants we found on the sand-hills had leaf-blades almost uniformly with a diameter of less than an inch.

New plants were not wanting. There were not only new species, but a new genus was represented by an abundance of a prostrate shrub.

One particularly attractive new species of uncertain relationship, with the habit of a yellow-flax (*Cathartolinum*), was abundant in the white sand. The new genus to which reference has already been made[1] was found with both flowers and ripe fruits. It belongs to the knotweed family and is related to the genera *Polygonella* and *Thysanella*.

Examinations of those ancient dunes at successive seasons would doubtless yield additional novelties, for the seasonal

[1] Journal of the New York Botanical Garden **21**: 48. 1920.

periods of the plants, particularly annuals, under the desert conditions prevailing there, are evidently exceedingly short.

A spiderwort (*Tradescantia*), perhaps new, should be mentioned here on account of the delicious violet-fragrance of its bright-blue flowers. It was abundant in the high pineland.

Leaving the sand ridges and continuing eastward we were soon back on the Istokpoga prairie. And here, in one low place, we found a veritable orchid garden. Two terrestrial orchids, a snake mouth (*Pogonia*) and a grass-pink (*Limodorum*) grew amidst the low grass in countless thousands.

Fire! Fire!! Fire!!!

This word might be repeated scores of times during a day's travel in southern Florida. In nearly every direction one turns clouds of smoke go rolling skyward. On this occasion nearly the whole Istokpoga prairie was on fire. And far to the southeast was that continuous cloud of smoke from the delta of the Kissimmee River. A doleful story, for the hammock and humus there has been burning for years, the heaviest rains having failed to extinguish it.

Observation on the Kissimmee flats shows the herbaceous vegetation to be composed of very low, often prostrate, plants. Those blooming at the time we were there were two kinds of figworts, a hedge-hyssop (*Gratiola*) and a false-pimpernel (*Ilysanthes*). The shrub, scattered over the flats, was a bright-yellow St. John's-wort (*Hypericum nudiflorum*). We had noticed the trunks of the cabbage-trees (*Sabal Palmetto*) in the vicinity of the flats to be broadly girdled about three feet above the ground, and were at a loss to account for the condition. However, a little observation soon solved the problem. The cattle of the region, being unable to rid themselves of flies collected on their sides out of reach of tail or tongue, walk around the cabbage trees scraping their sides against the rough trunk, thus getting rid of the flies, but gradually wearing the tree away.

As the afternoon was well spent, we hurried across the prairie to the head of Lake Okeechobee, thence down the eastern shore as the sun set, and out on the prairie east of the lake just before darkness fell. Thence we made our way over the trail to the eastern coast as fast as possible. In the fifty odd miles to Jupiter we saw no signs of a human being except the ferry-

man at the Saint Lucie slough, the lights of a few lone houses nearby, and the campfires of scattered Seminole Indians here and there in the pine woods. We reached West Palm Beach at midnight and spent the remainder of the night there. Early the following forenoon found us in Miami.

(To be continued)

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## THE PRESERVATION OF OUR NATIVE PLANTS

The income from the Stokes' Fund for the investigation and preservation of our native plants has not been used since 1916 for any further publication of colored plates, prices of printing having greatly increased and good results in color-work being difficult to obtain. There are four more plates with descriptions ready to print of the Canada Lily, Cardinal Flower, Holly, and Rhododendron.

But the time has not been lost, for we have added greatly to our collection of colored lantern slides, notably by the purchase of a beautiful set from the J. Horace McFarland Company; others have been received from Miss Elsie Kittredge, Miss Fleda Griffith, and from L. W. Brownell. They have been used to good advantage for the benefit of the Garden Clubs, two of whose objects are: "to aid in the protection of native plants and birds; and to encourage civic planting."

Lectures have been given to the following local Garden Clubs: Staten Island, New Rochelle and Larchmont, Bedford and Pleasantville, New York; Leonia, Short Hills, Plainfield, Bernardsville, Rumson, Princeton and Trenton, New Jersey; Litchfield and Ridgefield, Connecticut; and Lenox, Massachusetts. To all of these, duplicates of our leaflets, pictures, posters, buttons and pledges have been sent and a number of them have joined the Wild Flower Preservation Society as Associate or Life Members. "Wild Flower Committees" are being organized this year by many of the Clubs that are members of the Garden Clubs of America and they are planning to devote "one program a year to wild flowers and native conservation" and are giving space in each issue of their Bulletin to this department. Two leaflets have so far been issued: number 1,

on "State and County Parks," being an account of an interview with Henry C. Cowles, Professor of Plant Ecology of Chicago University, President of the Wild Flower Preservation Society and a member of the Committee on "Plant Sanctuaries" for the Preservation of Natural Conditions, of the Ecological Society of America, who in coöperation with Professor Bray, of Syracuse, J. W. Harshberger, of the University of Pennsylvania, and others, have been devoting much attention to this work since 1917. The Committee includes sixteen other members and their records cover all the States of the Union and British America with advisers in Entomology, Ornithology, Fisheries and Grazing.

Having served also as Secretary-Treasurer of the Wild Flower Preservation Society, for several years, the correspondence has been large and more or less similar, with numerous requests for information, literature and help. We feel greatly encouraged by the fact that an active Chapter has been founded in Chicago with seven hundred members and twenty-six associate schools; they are coöperating with about thirty-five of the local clubs of Chicago and its vicinity, including Botanical Clubs and Audubon Societies, by holding annual exhibits covering many branches of Natural History and educating the children to be interested in all of them! They also give Summer Fêtes for the children.

In Washington, where some of our earliest work was done, they have reorganized and are planning for Arbor Day work this year. They have issued circulars to teachers for use on Arbor Day and May Day, have given lectures and exhibits and conducted field trips for the Boy Scouts for observing and photographing wild flowers. A printed series of posters of the Maryland State Laws, protecting the Holly, Mistletoe and Evergreens are issued free and they have also conducted a publicity campaign in the newspapers of the District of Columbia.

We have Associate Clubs and members in each of the following states: New York, New Jersey, Pennsylvania, Maryland, District of Columbia, Florida, Texas, Arkansas, Illinois, Indiana, Ohio, Wisconsin, Minnesota, Michigan, Colorado, California, Washington and Vancouver Island. We are also a member of the Mountaineering Club of America and receive many of the publications of the Associated Clubs.

Our President, Dr. Cowles, has been a delegate to the National Parks Convention at Madison, Wisconsin, January 11 and 12, where he represented the Wild Flower Preservation Society and the Ecologists of America.

The Ecological Society of America, organized in 1914, has been studying the effects of climate and weather and of soil on the association of plants into natural groups or plant formations; their geographic distribution and relation to animals, including insects, birds and mammals; the sequence of the reappearance of vegetation in devastated regions, and the preservation of natural conditions for both animals and plants. They include among their members: Zoologists, Botanists, Entomologists, Foresters, Geographers, Plant Pathologists and Naturalists.

We have also had some correspondence and exchange of publications with the Swiss League for the Protection of Nature and received a set of the auto-chrome plates of their Alpine Gardens, full of beautiful wild flowers. Through the Smithsonian Institution we have also supplied a full set of our publications to the Czechoslovak Republic. Even the Botanical Survey of the Union of South African States is fostering an interest in their native plants in order to encourage their preservation and cultivation!

The National Geographic Society has published forty-four of Miss Eaton's exquisite colored plates of native and introduced plants and an account, also illustrated in colors, of the State Flowers. In May, 1915, they published an article on the May Flower, by F. V. Coville, and June, 1916, another by Mr. Coville on the Taming of the Wild Blueberry, both of great interest.

The Comstock Publishing Company of Ithaca, New York, has recently issued a set of twenty-nine uncolored plates, also from Miss Eaton's drawings, for use in schools, including twelve of our wild flowers: Trailing Arbutus, Hepatica, Dutchman's Breeches, Bloodroot, Spring Beauty, Adder's Tongue Lily, Columbine, Marsh Marigold, Violet, Trillium, Moccasin Flower and Jack-in-the-Pulpit. It is a most encouraging sign that everywhere efforts are being made to reach the school children, boy scouts, camp-fire girls and girls' camps, and Young Men's and Young Women's Christian Associations, and to coöperate with

the Audubon Society in trying to teach the children to love the birds and wild flowers and to help preserve them, and by means of poems, drawings and illustrated lessons they are becoming familiar with many species. The Nature Study League of New York City, under the able guidance of Mrs. Northrop and the Natural Science Committee of Hunter College, is reaching some of the down-town schools of Manhattan, and is holding its first public meeting at the American Museum of Natural History on February 9, 1921.

We have lectured and sent pledges, buttons and the Stokes' sets of colored pictures of wild flowers needing protection to many of the public schools, high schools and colleges and public libraries of the Bronx, Manhattan and Brooklyn. We have also coöperated with the Conservation Department of the General Federation of Women's Clubs of which Mrs. John Dickinson Sherman is Chairman and sent them an exhibit of our publications and pictures, and have also sent all our publications to the New York State Conservation Commission.

In Bulletin 9 of the "Permanent Wild Life Protection Fund," Mr. Hornaday has a report on the progress of the movement to induce land-owners to forbid shooting of any kind on their estates. There are now no less than 3131 such sanctuaries in the United States, covering in all a million and a half acres. Oregon leads with over 800,000 acres and yet Oregon in a referendum vote has just declined to preserve the famous Malheur Lake bird reservation and has turned it over for land drainage and speculation. It is hoped that through the influence of the Garden Clubs of America and the Ecological Society, similar reservations for the protection of plants may be secured and the cooperation of all nature lovers is solicited.

In May, 1917, the American Museum Journal devoted three pages to an article on The Conservation of Wild Flowers, which Miss Dickerson illustrated by a series of twelve photographic reproductions from native plants and they also issued a beautiful series of duotone photographs with an article on the Season of Wild Flowers. The illustrations were done by the De Vinne Press of New York and are exquisite examples of fine reproduction.

The importance of many native plants as food for birds and their relation to insects and agriculture has not been over-

looked, and Dr. G. Clyde Fisher, of the American Museum of Natural History, delivered a lecture here at the Garden on May 18, 1920, and is preparing a leaflet for publication on this topic. He has also given a well-illustrated lecture on the relation of forests to rainfall and water supply.

Mr. Norman Taylor, of the Brooklyn Botanic Garden, whose practical knowledge of the local flora is of great value, has also been coöperating with us by delivering some of the lectures to the Garden Clubs of the vicinity, and it is hoped that he and Mr. Durant, who is associated with Mr. Gillette, will tell us how to transplant and grow the wild flowers successfully.

The Torrey Botanical Club, whose membership is mostly in New York State, has become a Life Member of the Society, and two of our annual meetings have been held in conjunction with theirs, our State Botanist, Dr. Homer D. House, having addressed us last year and exhibited the colored plates from the Wild Flowers of the State, recently published. Dr. House has been exerting his influence at Albany and throughout the State to arouse public feeling, and Professor W. L. Bray has also been interested in the preservation of the Hart's Tongue Fern at Syracuse, and in coöperation with the Syracuse Botanical Club and the Ecological Society of America, has succeeded in having set aside the Station at Green Pond as a State Park.

ELIZABETH G. BRITTON,
*New York Botanical Garden,*
*Bronx Park, New York City*

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## FRANCIS LYNDE STETSON

Francis Lynde Stetson, a member of the Board of Managers of the New York Botanical Garden since 1908 and a Vice-President of the Garden since 1914, died at his residence in New York City on December 5, 1920, after a prolonged illness. He was in the seventy-fifth year of his age.

Throughout his association with the institution he was active in its behalf, serving nearly continuously as a member of the Executive Committee and for a series of years as its legal ad-

viser. He was keenly interested in all phases of its work, more particularly, perhaps, in its scientific and educational development, but he was intensely fond of plants of all kinds, a born nature-lover. His large estate at Skylands, in northern New Jersey, his summer home, gave him great pleasure, providing space for the planting and cultivation of a noteworthy collection of trees and shrubs, with vegetable and flower gardens and extensive farming operations, together with ready access to large areas of forests, fields and meadows, and he took keen delight in all these. Wild plants were of great interest to him and he was an enthusiastic advocate of the preservation of natural features and the conservation of natural resources.

He freely and generously contributed both time and money to the development of the New York Botanical Garden, and his advice has been of great value to the institution. His services to botanical science are commemorated by the genus *Stetsonia*, a gigantic and characteristic cactus of the Argentina Republic, named in his honor.

*Resolved*, That the Managers of the New York Botanical Garden deeply mourn the loss of an esteemed and beloved friend and associate.

*Resolved*, That the foregoing preamble and resolution be entered on the minutes, and that a copy be transmitted to his bereaved family.

Approved by the Board of Managers of the New York Botanical Garden January 10, 1921.

N. L. BRITTON,
*Secretary*

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## FANNY BRIDGHAM FUND

The Garden has recently received a legacy of $30,000 from the executors of the will of the late Mrs. Samuel Bridgham. At the annual meeting of the Board of Managers on January 10, 1921, the following resolutions were adopted:

*Resolved*, That the legacy of $30,000 received from the estate of Mrs. Fanny Bridgham be designated a permanent fund under the name "Fanny Bridgham Fund," and that its income be used, after investment, for the purchase and binding of books for the library unless otherwise ordered by the Board of Managers.

*Resolved*, That the managers gratefully receive the generous gift of Mrs. Bridgham and that the Director-in-Chief is authorized to express their appreciation of the gift to Messrs. Cadwalader, Wickersham & Taft, with the request that they communicate these resolutions to Mrs. John Innes Kane, sister of Mrs. Bridgham.

The following letter was received from Mrs. Kane:

January 20, 1921.

My dear Dr. Britton:

Messrs. Cadwalader, Wickersham and Taft have communicated to me the resolutions adopted by the Board of Managers of the New York Botanical Garden, concerning the legacy left to the "Garden" by my sister, Mrs. Bridgham.

Will you kindly express to the Board my appreciation of these kind resolutions and my gratification that it has seen fit to designate this legacy as a Permanent Fund.

Very sincerely yours,

(Signed) ANNIE C. KANE.

The income of this fund will aid greatly in the building up of the library.

Mr. Samuel Bridgham, who died some years ago, was a botanical artist of distinction. He made many drawings for the late Professor W. G. Farlow, of Harvard University, and many for "Illustrated Flora of the Northern States and Canada."

N. L. BRITTON

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## GREENHOUSE LECTURES

### MARCH AND APRIL, 1921

The regular public lectures in the Central Display Greenhouse, Conservatory Range *2*, will be given this spring at 3:15 o'clock on *Sunday* afternoons, instead of on Saturdays as heretofore. Living plants will be used in illustration. Dr. Rusby will open the series with a talk on South American drug plants, and this will be followed by discussions of various other groups of plants, some of which are of immense importance economically.

March 20—"South American Drug Plants," Dr. H. H. Rusby.
March 27—"Bulbous Plants and How to Force Them for the Home," Dr. M. A. Howe.

April 3—"Fiber Plants," Dr. A. B. Stout.
April 10—"Milk-trees and Other Lactiferous Plants," Dr. W. A. Murrill.
April 17—"Air Plants," Dr. H. A. Gleason.
April 24—Desert Plants," Mr. G. V. Nash.

Conservatory Range 2 is situated at the eastern side of the Botanical Garden, north of the Allerton Avenue entrance. It is most conveniently reached from the Allerton Avenue Station on the White Plains Extension of the Subway from East 180th Street. Visitors coming by train to Botanical Garden Station should inquire at the Museum Building.

W. A. MURRILL

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## CONFERENCE NOTES FOR JANUARY

The regular monthly conference of the scientific staff and students of the Garden was held on the afternoon of January 5, 1921. Brief reports were made by Dr. H. A. Gleason, Dr. J. H. Barnhart, Dr. Michael Levine and Professor R. A. Harper, regarding matters of botanical interest at or in connection with the annual session of the A. A. A. S. Following these, Mr. G. T. Hastings gave a very interesting report on "Succession of Algae in the Grassy Sprain Reservoir," an account of which, prepared by Mr. Hastings, will appear later in this JOURNAL.

A. B. STOUT,
*Secretary of the Conference*

## NOTES, NEWS AND COMMENT

Mr. Oakes Ames, Director of the Botanical Gardens of Harvard University, has recently published the sixth fascicle of his "Illustrations and Studies of the Family Orchidaceae," and has presented a copy of this important work to our library, the five preceding fascicles having been presented by him as they were published during the past few years. This fascicle contains two papers, the one on the Orchids of Mount Kinabalu, British North Borneo, in the writing of which Mr. Ames has been assisted by Mr. Charles Schweinfurth; the other is the seventh contribution by Mr. Ames upon Philippine Orchids. The fascicle is illustrated by twenty-one plates drawn by Mrs. Ames, and it is dedicated to Mr. Elmer Drew Merrill, in recognition of his distinguished services to Malayan Botany. The part of the fascicle on Philippine orchids is also published as a separate in twenty-five copies, one of which Mr. Ames has generously presented to the library of the Garden.

Over 600 biology pupils from Morris High School spent the forenoon of January 18 at the Garden studying the museum and living plant collections under the guidance of their teachers and members of the Garden staff. They also heard a lecture on forestry given by Mr. Inman.

About 200 biology pupils from Evander Child's High School visited the Garden on January 20 to study the plants in the Conservatories, the trees in their winter conditions, and certain economic plant products in the Museum. Mr. George T. Hastings delivered an address on forestry in the public lecture hall, which was much appreciated both by the pupils and their teachers. Members of the Garden staff acted as guides and instructors.

*Meteorology for January.*—The total precipitation for the month was 2.39 inches, of which 0.20 inches (two inches by snow measurement) fell as snow. The maximum temperatures recorded for each week were as follows: *59° on the 2nd*, 52° on the 4th, 53° on the 14th, 57° on the 23rd, and 44° on the 30th. The minimum temperatures were: 20° on the 7th, 18° on the 13th, *4° on the 19th*, and 5° on the 25th.

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Vol. 3, part 1, 1910. Nectriaceae—Fimetariaceae.

Vol. 7, part 1, 1906; part 2, 1907; part 3, 1912; parts 4 and 5, 1920; part 6, 1921. Ustilaginaceae—Aecidiaceae (pars). (Parts 1 and 2 no longer sold separately.)

Vol. 9 (now complete), parts 1–7, 1907–1916. Polyporaceae—Agaricaceae (pars). (Parts 1–3 no longer sold separately.)

Vol. 10, part 1, 1914; parts 2 and 3, 1917. Agaricaceae (pars).

Vol. 15, parts 1 and 2, 1913. Sphagnaceae—Leucobryaceae.

Vol. 16, part 1, 1909. Ophioglossaceae—Cyatheaceae (pars).

Vol. 17, part 1, 1909; part 2, 1912; part 3, 1915. Typhaceae—Poaceae (pars).

Vol. 21, part 1, 1916; part 2, 1917; part 3, 1918. Chenopodiaceae—Allioniaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913; part 6, 1918. Podostemonaceae—Rosaceae.

Vol. 24, part 1, 1919; part 2, 1920. Fabaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

Vol. 29, part 1, 1914. Clethraceae—Ericaceae.

Vol. 32, part 1, 1918. Rubiaceae (pars).

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

**Memoirs of the New York Botanical Garden.** Price to members of the Garden, $1.50 per volume. To others, $3.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

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**NEW YORK BOTANICAL GARDEN**

**Bronx Park, New York City**

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# JOURNAL

OF

# The New York Botanical Garden

EDITOR

R. S. WILLIAMS

*Administrative Assistant*


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Mr. Billy Bowlegs in his corn-field on Indian Prairie, west of Lake Okeechobee. Bowlegs is a descendant of the famous Indian Chief of a century ago. His field was once a palmetto hammock as is evidenced in the plate, by the palm stumps still standing among the corn. The palmetto trunks have been made into a snake fence to be seen in the background, which separates the fields of father and son. The son's corn, several weeks older, may be seen on the far side of the fence. The soil of the prairie is sand, but in the palmetto hammocks the accumulated humus

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# OLD TRAILS AND NEW DISCOVERIES

WITH PLATES 255 AND 256

(*Continued*)

## FLORIDA KEYS

Two days later we set out for another cactus center, namely, the Florida Keys. The "Barbee" had started for Key West on Monday morning, and the writer left Miami the following day for that port by train. Both boat and train reached Key West at six o'clock Tuesday evening. Several among many interesting observations made from the train may be worthy of notice. First, it is often said that the cocoanut tree always grows with its swollen trunk-base curved towards the prevailing wind or toward the water. This does not hold in the case of the cocoanuts on the keys, for they grow in various postures. Second, vegetation has sprung up and now thrives on the lime-rock ballast of the concrete viaducts connecting different keys: beggar-ticks (*Bidens leucantha*), sand-spurs (*Cenchrus carolinianus, C. echinatus*), rush-grass (*Sporobolus domingensis*), horse-weed (*Leptilon canadense*), pepper-grass (*Lepidium virginicum*), and spurge (*Chamaesyce* sp.). These appeared to be the most abundant kinds. Third, a great many century-plants (*Agave*), both of native kinds and introduced, were in flower, a feature which gave, especially to Key Vaca and its neighboring islands, a most unusual aspect.

Cactus-hunting interested Mr. Cuthbert so much, that according to prearranged plans he joined us at Key West in order to make the cruise through the Keys to Miami.

We spent a day searching all parts of Key West for cacti. Prickly-pears were abundant, of course, and we found plenty of the recently described *Opuntia zebrina*, which was collected once before on that island, and also some scattered remnants of the tree-cactus (*Cephalocereus keyensis*) towards the eastern end of the key; but the main object of our search, a prickly-apple (*Harrisia*), failed to appear anywhere. After gathering some miscellaneous specimens we gave up our search there and prepared to leave the island early the next morning.

Big Pine Key was our next destination. A strong east wind prevented us from taking the outside or more direct course. Consequently, we started on the inside course, which runs in a somewhat semicircular curve around a labyrinth of small islands on the inner side of the reef. After bucking a bad sea for several hours, we located a stake about a mile east of Harbor Key and found our way into Big Spanish Channel, whence we picked our way gradually southward between No Name Key and Big Pine Key.

Inquiries at the settlement on Big Pine for the locations of hammocks with which we were not already acquainted failed to bring much encouraging information. Most of the former large hammocks had long ago been destroyed in making charcoal for supplying Key West, and furthermore, during our former explorations there we had never met with any of the kinds of cacti we now sought. However, the report of some hammock growth towards the upper end of the island decided us to retrace our course for about five miles and land at a point indicated by our informant. We were not long in locating the site of a former hammock by the character of the shrubs and an occasional surviving tree. An extended search in that region failed to disclose any cacti, however, except prickly-pears. We did find, though, a shrub new for Florida. This was a kind of candle-wood, *Dodonaea Ehrenbergii*, a plant first found on Hispaniola, and not previously known this side of the Gulf Stream.

Failing of our object there, we retraced our course to the settlement, where we made a search of several remnants of hammocks, but the search was wholly barren of results so far as cacti were concerned.

However, at last we heard of a hammock near the south-eastern tip of the key which, so they said, hunters shunned

"because cacti grew so thickly there that dogs couldn't get through." We at once returned to the "Barbee" and moved to the lower end of the island. After landing on the extensive plain that stretches beyond the pine woods, we located a charcoal-burner's trail and followed it. This trail led toward an insignificant-looking hammock, which, from a distance, the writer had theretofore taken to be a mere button-wood swamp. We entered the hammock and there, to our great surprise and delight, our eyes were confronted with cacti of no less than eight different kinds. There were not less than five genera.

But most pleasing to behold was that plant we particularly sought, a species of *Harrisia*.

Not many years ago only six kinds of cacti were recorded from all Florida, or, in fact, from all the Southern States; but here we had found eight quite distinct kinds growing in one small area. These cacti fall naturally and equally into two categories: *Opuntia Dillenii*, *O. keyensis*, *O. austrina* (maritime form), and *Acanthocereus pentagonus*, these representing common plants in tropical and subtropical Florida; *Cephalocereus keyensis*, *C. Deeringii*, *Harrisia* sp.?, and *Opuntia* sp.?, representing rare plants.

In order to understand the relationship of the *Harrisia*, however, we needed the flowers and fruits. Curiously enough, the numerous plants at the time of our visit had only young flower-buds and immature fruits. The prickly-pear just referred to had neither flowers nor fruits, but its vegetative characters showed it to be a new species of a group of the genus *Opuntia*, the Semaphores, none of which had previously been found this side of the Gulf Stream.

This most remarkable natural cactus-garden east of the western American deserts has maintained itself in spite of the fact that its other shrubby and arboreous elements have been cut out many times for furnishing wood for charcoal, charcoal burning having been in progress there for perhaps half a century. This is doubtless the hammock where Dr. J. L. Blodgett[1] and others in the earlier half of the last century collected

[1] John Loomis Blodgett (1809–1853) was born at South Amherst, Massachusetts, and studied medicine at Pittsfield. After a brief residence in the gulf states, and two years in Liberia, he settled at Key West, where he spent nearly fifteen years as physician and druggist. He was the first to make important botanical collections on the lower Florida keys.—JOHN HENDLEY BARNHART.

several typically West Indian shrubs that have not been found in Florida since. In fact, our incursion into that hammock was perhaps the first of its kind in more than three-quarters of a century. It is hoped to make an early survey of that locality for plants other than cacti.

This locality proved extremely interesting, not only from a botanical standpoint, but also from that of geology. Although it has long been known that the main groups of the Florida Keys, the Lower and the Upper, were in a general way separated by the Bahia Honda Channel, the writer has never been able to get information as to the real line of demarcation. The position of this hammock on the southern tip of Big Pine Key, however, gave a clue, at least, to the real line of division between the groups. The hook at the southern end of Big Pine Key has always seemed an extraneous part of the island. It is largely covered with marl, but the examination of this hammock showed that the rock structure is coral and not oölitic limestone. It is thus of a different geological period from that of the body of Big Pine Key. It is coral built up on the lower edge of Big Pine and really formed of an island now a peninsula, with an east-west long axis similar to that of the Upper Keys. Now to prophesy a little: Newfound Harbor Keys and Loggerhead Key also, with an east-west long axis, will doubtless be found to be of coral rock, instead of limestone, as they are now indicated on geological maps. The determination of this point and an exploration of their hammocks are looked forward to with much interest. If this prophecy comes true, the line of demarcation between the two groups of Keys will not be a north-south line, running between Bahia Honda Key on the east and Little Pine Key and No Name Key on the west, but an east-west line, from a point between Bahia Honda Key on the south and No Name Key on the north, running across the isthmus south of the limestone or pineclad part of Big Pine Key on the south, and the limestone keys on the north. Thus, instead of a complete separation of the two groups of islands, we would have an overlapping of the groups where they approach each other.[1]

[1] Since this paper was in type, the writer found that the conditions existing at the southern end of Big Pine Key and on one of the Newfound Harbor Keys, as stated above, were recorded by Samuel Sanford in a paper on "The Topography and Geology of Southern Florida," published in the Second Annual Report of the Florida State Geological Survey.

Among the interesting phenomena at this meeting point of the coral-rock and the oölitic limestone—and they are too numerous to record in this paper—may be mentioned the intermingling of the two tree-cacti of the East. In spite of the devastation of half a century, we found many fine trees of the key tree-cactus (*Cephalocereus keyensis*) formerly known only from Key West, and reported from Boca Chica Key, and the Deering tree-cactus (*Cephalocereus Deeringii*), heretofore known only from coral-rock on Umbrella Key and the Matecumbe Keys,[1] all indicating an interesting meeting place of plant species as well as of geological formations.

Having secured the desired specimens, we set out in the evening for Madeira Bay. We ran over the reef outside as far as the Bahia Honda Channel, where we turned into the Bay of Florida and started up the inside channel. A short stop was made on Bahia Honda Key. This differs from most, or perhaps all of the larger keys in having the rock foundation covered with a rather thick accumulation of sand; it is really a large but rather low sand-dune. On it two plants may be found in abundance that are not known to grow elsewhere this side of the Gulf Stream. One of these is a copiously branched and very copiously flowered vine of the morning-glory family (*Jacquemontia jamaicensis*) which has never been found elsewhere on the Florida Keys. The other is a remarkably spine-armed shrub of the madder family, *Catesbaea parviflora*, a relative of, but more diminutive in every way than the lily-thorn or spine-apple (*Catesbaea spinosa*) of the Bahama Islands, where our plant is also a native. It formerly grew on Big Pine Key, but it is apparently extinct there now. There is no tall vegetation on the island, and besides the herbaceous elements and scattered, scrubby, woody plants, low palms are usually the most conspicuous objects in the landscape.

After getting under way again, the east wind freshened and we decided to go as far as Bamboo Key and anchor for the night in its lee. Night fell before we reached Key Vaca, but we continued steadily and rapidly towards our objective, evidently more rapidly than we suspected, for the island we took to be Bamboo Key turned out to be Channel Key, at least six miles

[1] Journal of the New York Botanical Garden **17**: 198. 1916; **18**: 199–203. 1917.

beyond Bamboo Key; for unsuspectingly, in attempting to run in behind the island, we piled up on a shallow sand-bar, nothing the like of which is about Bamboo Key. By reversing the engine at once we pulled the boat off without delay. Bamboo Key is so low and devoid of hammock[1] that we had evidently passed it unobserved in the dark.

We had made better time than we suspected, owing doubtless to the increased power of the motor, as a result of the damper air of the night; but our Bahamian crew insisted that it was due to the fact that "water is always thinner at night than in the day time!"

Having passed our proposed anchorage, we decided to keep going until we reached Long Key, about five miles distant. By successfully locating the stakes of a channel through some shallow banks and keeping well to the north of some wreckage with which we were acquainted, we soon reached the anchorage.

At sunrise we resumed our journey and called at Lignum Vitae Key. There we secured a supply of a peculiar kind of prickly-pear for study, and then made all possible speed towards Madeira Hammock. During the preceding evening thunder storms were around us in all directions, but the weather cleared and we were treated to a wonderful sunset. The atmosphere during the following day was exceptionally clear and extremely bright. It was impossible to locate the horizon, and small keys in the distance seemed to stand high above the water, thus looking not like islands but aeroplanes.

As soon as we cast anchor at the entrance to Madeira Bay, we crossed the bay in a row-boat and went ashore, where we found more specimens of *Harrisia*. The plants of this genus are either terrestrial, or epiphytic, and sometimes grow on the trunks or branches of trees ten or twelve feet above the ground.

Madeira Hammock is full of animal life, and we invariably have experiences there with some branch of the animal kingdom—sometimes with rattlesnakes, often with yellow-jackets, oftener yet with mosquitoes. On this occasion one member of our party was enabled to study wasps at close range. He collided with a nest. In addition, the horse-fly season was on in southern Florida. Although we had met with only a few flies

[1] Journal of the New York Botanical Garden **18**: 107. 1917.

in the hammock, when we returned to the "Barbee" the cabin was swarming with them, and we were well on our way before we were rid of the pests.

The sun was setting as we sailed away from Madeira Bay. After passing Pigeon Key we spent the evening hunting or rather haunting bars, banks, and barriers. If we did not at once find the channel stakes on a bank we would run along the bank in one direction or another until we picked them up. Thus, after negotiating one channel after another, we came to anchor at midnight in Black Water Sound, about a mile west of Snake Point and Jewfish Creek. With the wind in our favor we hoped to get a few hours of uninterrupted sleep safe from the attack of mosquitoes. Our hopes were realized—for two hours. Then all on board awoke at the same time, fighting for life. The mosquitoes had "boarded" us in a cloud. The battle lasted an hour. Then, suddenly, the mosquitoes had disappeared, and all hands fell off to sleep again as peacefully as if nothing had happened and slept soundly until awakened by dawn. Whence those mosquitoes came and whither they went is still a mystery.

The sun rising on Barnes Sound found us on the last leg of our cruise, which terminated in the early afternoon at Miami, where we disembarked and cared for the collections.

## Miami and Marco Island

After an interval of three days, which was devoted mainly to local investigations in the vicinity of Miami and in cactus studies at Buena Vista, a third extensive excursion, again by land, was inaugurated. The country from the mouth of the Caloosahatchee to the Ten Thousand Islands was our most distant field. Our route was the same as that of the excursion to the Manatee region as far as Okeechobee City. Two weeks had elapsed and the season had advanced.

The two conspicuous and strongly contrasted plants of the "scrub" along the eastern coast were the Caribbean-pine (*Pinus caribaea*) with dark-green foliage, and the saw-palmetto (*Serenoa serrulata*) with whitish foliage. The leaves of the saw-palmetto that grows in the "scrub" are nearly always glaucous or grayish-white. In the rocky pinelands of the Everglade Keys the leaves are either green or grayish-white, while in the

sandy pine woods and hammocks in other parts of the state they are typically green. The palm plants of the "scrub" are typically more robust than those of other localities. The reason for these variations presents a problem for some one to solve.

The beautiful, not to say elegant, tar-flower or fly-catcher (*Befaria racemosa*) stood in noticeable clumps here and there in the pine woods and high prairies. The low prairies, both in the coastal region and inland, seemed covered with drifts of golden-yellow snow, if such a phenomenon can be imagined, on account of the copious growth, bearing countless myriads of flowers, of bladder-worts, mainly *Stomoisia*, and the numerous ponds were thus made into mirrors with golden-yellow frames. In some of the lower prairies where the bladder-worts were less plentiful, other colored flowers predominated; meadow-beauties (*Rhexia*) and orchids were often abundant. Among the latter, grass-pinks (*Limodorum*) furnished bright colors, while the dainty-orchis (*Gymnadeniopsis nivea*), though lacking color, was conspicuous on account of its habit, suggesting so many tiny lamps scattered over the prairies.

If it were not for these numerous showy plants, Hungry Land would be desolate indeed. It is practically uninhabited, and in addition to the moss-draped hammocks and cypress-swamps, in some places the Florida-moss (*Dendropogon usneoides*) hangs in long streamers from the pine trees. Even Indians do not live there.

The land on the western side of Hungry Land slough, the Allapattah Flats, is somewhat less depressed and less depressing. It is inhabited by few white people, but by the Seminoles in considerable numbers, as we discovered by experience. Since our recent journey through that land, heavy rains had submerged parts of the trail. At one submerged point where the trail forked we inadvertently took the left-hand branch instead of the right and in a short time found ourselves in the midst of a number of Indian camps. We soon retraced our mistaken course and hastened on through the Allapattah (Seminole for alligator) Flats.

Plant life was represented in many interesting ways. However, two phenomena were particularly impressed on the writer: the often extensive turf formed of a sedge (*Eleocharis*) and the

brilliant yellow of a Saint John's-wort (*Hypericum aspalathoides*), which, when the numerous flowers were in large masses, presented such a striking yellow that it was almost painful to the eyes. Steady traveling soon brought us to Okeechobee City, whence we set out westward for the crossing of the Kissimmee River. The vegetation changes suddenly beyond the pine woods west of Okeechobee City. Palmetto hammocks appear, as do also live-oak hammocks, both dense and open, and hammocks of mixed trees. On the prairies a maze of cattle trails run between and among myriads of large broom-like clumps of a stiff grass (*Spartina Bakeri*) and peculiar circular patches of the saw-palmetto. The latter plant was then in flower nearly everywhere and the violet-scented fragrance of its flowers filled the air.

After crossing the Kissimmee at Cabbage Bluff we headed southwest for the Caloosahatchee. There were no made roads as far as Fisheating Creek, so we were able to make good speed. The natural packing of the sand of those prairies is so firm that the traffic of horses, oxen, wagons, and, of late, automobiles, over a trail never seems to impair it to any serious extent; but when it is disturbed so as to make a roadbed, it soon becomes practically impassable, until it is surfaced with some hard material.

Out across the great palmetto prairie we presently penetrated probably the most remarkable growth of cabbage-trees (*Sabal Palmetto*) in existence. This palm grows there singly or in groups of dozens, hundreds, and thousands, forming groves essentially to the exclusion of all other trees. The magnitude of the growth was most impressive and often most beautiful.

The trail winds in and out among the hammocks in blind curves, and as we took one of these we nearly collided with an Indian, Billy Stuart, who was out with his family on a "joy-ride" in his ox-car. As he was making perhaps one mile an hour we averted a head-on collision. We even stopped for a short visit and before we separated Billy invited us to call at his camp, at the same time explaining to us how to find it by leaving the trail at a designated hammock, on our return trip.

By the time we reached Fisheating Creek it was dark, and cloudy as well. But we crossed the creek and found the trail leading to the Caloosahatchee. When about half-way to the

river we lost the trail, though, and later when the clouds cleared the stars indicated that we were traveling through the open pine woods towards the southeast instead of on the prairie to the southwest. Several lights appeared far ahead, so we hastened toward a supposed settlement to inquire concerning our whereabouts. When we came near the lights, instead of houses we found some burning stumps, the remains of yet another forest fire. Consequently, the only alternative was to double our course until we recovered the trail. This done, we made the Caloosahatchee in good time, crossed it at LaBelle and followed it to Fort Myers, reaching our destination just before midnight. We had covered the distance from Miami in about fifteen hours, including time for lunch and that consumed in twice losing the trail.

The next morning we set out for our most distant objective, namely Marco and vicinity. Traveling southward, after passing through several miles of sandy pineland, we came to the Lossmans River limestone which supports a succession of cypress swamps, and which was in some places overlaid with ancient sand-dune, the "scrub." The cypress trees of the swamps were sometimes associated with a peculiar-looking pine, the trunks of which were very slender and tall. After crossing several streams, whose bordering hammocks would also doubtless prove to be interesting collecting grounds, we came to the settlement of Naples, a town which is built on a spur of the "scrub," that here abuts directly on the Gulf of Mexico. Here, moreover, we found the northern limit of the Ten Thousand Islands, a region which extends southward along the coast to near the Northwest Cape of Cape Sable, or a distance, in a direct line, of about seventy-five miles. We crossed areas of "scrub," back of the coastal islands, about half way between Naples and Marco, which region perhaps represents the southern known limit of the "scrub" on the western side of Florida. The "scrub" thus extends about equally as far south on the west coast as on the east.

The higher land there rapidly fell away and gave place to extensive salt marshes or prairies, where the more conspicuous vegetation was made up of the cabbage-tree (*Sabal Palmetto*), the saw-palmetto (*Serenoa serrulata*), and buttonwood (*Conocarpus erecta*), all of which, or particularly the two palms,

thrive equally well under the influence of salt water or fresh water, and also in either wet land or dry. Finally, we came within sight of the settlement of Marco, fifty-odd miles south of Fort Myers, where the white race is now engaged in the same pursuit that its prehistoric red race followed, namely, the oyster and clam business.

After arousing some of the inhabitants sufficiently to encourage them to cross the sound and learn our desires, we found that, with the usual foresight of such people for business, one of the ferry-lighters was at the bottom of the sound and the other was on the ways being repaired. Thus, the main object of our excursion, an examination of the hammocks about Caxambas Pass, was defeated. Leaving our car on the northern shore, we crossed the sound for a short investigation of the flora of the immediate vicinity of the settlement of Marco, leaving the Caxambas end of the island for future attention. This completed, we recrossed the sound and began to retrace our course northward.

Hard luck had evidently overtaken us at last.

An anticipated visit to the Royal Palm Hammocks of the Cape Romano district was also defeated, although we managed to get within about four miles of our objective. After repeatedly "bogging" in the dry sand of a side trail on the one hand and in the soft mud of the adjacent prairies on the other, we sought the main trail and set out for Fort Myers. Herbarium specimens were collected from the different plant associations. But the "scrub" was negatively interesting, that is, the season seemed to be very backward and very few plants were in flower. However, one notable shrub, a kind of lead-plant, an undescribed species of *Amorpha*, was found in full bloom. This plant was quite conspicuous, both in the matter of foliage and inflorescence, and, curiously enough, it seems to be most closely related to the lead-plant (*Amorpha canescens*) of the western plains.

The following morning we drove to Punta Rassa, which is situated at the mouth of the Caloosahatchee. With the cooperation of several fishermen, we were able to visit a number of islands at the mouth of the river. At Punta Blanca, at the mouth of the Caloosahatchee, the most likely place for the occurrence of *Harrisia*, we failed in our search, although the

plant was said to grow there formerly. Many of the plants usually associated with *Harrisia* were present, and several other kinds of cacti were plentiful. However, the locality proved very interesting historically as well as botanically. Unfortunately, most of the hammock had long been destroyed by the digging away of the shells of the once evidently important kitchen-midden. The shells and numerous human remains had been and are still being carried away for making roads in the vicinity of Fort Myers.

This locality, like the shores of other estuaries, was probably one of the places of rendezvous for the fierce Calusas, the aborigines of southern peninsular Florida and of the Keys. It was in this vicinity, it is said, that the Calusas captured and held as prisoners for a century, at least, an expedition of Caribs from the West Indies in search of a fountain of youth. They were maintained as a separate settlement. It may be that the Big Cypress Seminoles (Creeks) have the blood of the old Calusas and Caribs in their veins.

The most interesting object at Punta Blanca was the old fire-place and perhaps also sacrificial altar of the Calusas, for human sacrifice is said to have been practiced. The constant fires burned the accumulated shells into a solid mass of lime, which increased in height as the kitchen-midden was gradually built higher. When the shells in recent times were removed for road-making material, this concreted fire-place was spared. But to pass from more ancient history to more modern: One of our fisherman navigators related to us the local interpretation and belief regarding the occurrence of the human skeletons in the shell heaps at Punta Blanca. The story runs as follows: In the early part of the last century a vessel bringing a large number of negro slaves from Africa was discovered and chased by a fleet United States revenue cutter. The slave vessel took refuge in the waters about what is now called Punta Blanca when the revenue cutter opened fire and killed all the negroes. Their bodies were then buried on the adjacent shore!

The same evening found us speeding up the valley of the Caloosahatchee. We reached a frontier settlement about bedtime and spent the night there, a night that will long be remembered, for giant cockroaches, big spiders, and scorpions played hide-and-seek over the bed till daylight. Dawn was welcome

In a slough north of Eagle Bay, Lake Okeechobee. This slough, now filled with a pop-ash hammock, was evidently, when the land was less elevated, the bed of a river which flowed from the prairies into Lake Okeechobee. Even now, water stands in it to the depth of one to three feet during part of the year. The ash trees consequently are amphibious. Notice the peculiar growth of the trees. Several stems or branches arise from a large, partly buried

when it at last arrived and we made haste to get away over the prairie trail. The massive hammocks on Fisheating Creek and its tributaries and adjacent sloughs were not only conspicuous, but beautiful. The pale under-sides of the sweet-bay leaves turned up by the breeze showed in striking contrast against the deep green fresh foliage of the associated trees.

The prairie flowers became more numerous day by day. Spider-lilies (*Hymenocallis*) were scattered throughout the turf. Marsh-pinks (*Sabbatia*) and meadow-beauties (*Rhexia*) formed bright patches in all the slightly depressed places. But the flower most notable, not on account of its size, but because of its countless numbers, was the yellow-eyed grass (*Xyris*) whose heads stood above the other herbaceous vegetation nearly everywhere as far as the eye could see.

In order to fulfill our social duty and make that call at Billy Stuart's camp, we left the trail where directed to do so. We had not proceeded an eighth of a mile before we saw an Indian perched on a stump about a quarter of a mile away, evidently with his eye on us. We met him and found he was Billy Bowlegs, evidently a descendant of the former celebrated chief of that name. He directed us to Billy Stuart's camp, which we found without difficulty. There were many camps in that region, all situated in palmetto hammocks. The hammocks, when cleared of the palms and shrubbery, also furnished the fields for growing corn, and many fine crops of maize were observed. We had a long talk with Billy Bowlegs in his cornfield. Among other things he said he liked cultivating crops very well; but hunting was more to his liking.

The social functions being over, we made all possible haste to cross the Kissimmee River. A boy who was on the ferry directed us to a short trail running from the Kissimmee to Okeechobee City. We could hardly believe him, but we agreed to try the new course and followed his direction. We found he was right and were surprised to learn that nearly half the distance of the trail we were used to traversing was eliminated. But, more interesting than the saving of distance was the finding of a new and very characteristic type of hammock. It was only a few hundred yards wide, but an indefinite number of miles long. The arboreous growth was almost exclusively of an ash (*Fraxinus*), but its habit was different from that of any

ash with which the writer is acquainted. The very short and broad bases of the trees were divided usually into from a half dozen to two dozen trunks. The trunks and limbs of the trees were copiously laden with epiphytes, both orchids and bromeliads, the latter predominating. The conspicuous orchid was the tree-orchid (*Encyclia tampense*), the only epiphytic orchid of southern Florida that does not definitely occur also in the West Indies. The bromeliads were chiefly *Tillandsia recurvata*, *T. bracteata*, *T. utriculata*, and the long-moss, *Dendropogon usneoides*.

We had so far been favored with good weather, but were now completely surrounded with severe thunder storms and we made haste to get into the region east of Lake Okeechobee. Along the recently opened right-of-way between Okeechobee City and the lake we found a sunflower (*Helianthus cucumerifolius*), a native of eastern Texas, naturalized in the ditches. A thistle (*Cirsium*), discovered on the eastern shore of the lake several years ago, was very plentiful in the cleared hammock land. This thistle has numerous close-set leaves and many medium-sized flower-heads, and it grows to a height of twelve feet. The discovery of the cucumber-leaved sunflower, as a naturalized plant, was fortunate, as it gave the writer an opportunity to compare it with its Florida relative, *Helianthus debilis*. He has maintained these very distinct species, although the "closet botanists" have for over a century considered them to represent but one species.

The wide beach, lately the bottom of the lake, was covered in most places with a sedge (*Cyperus LeContei*) and dog-fennel (*Eupatorium capillifolium*). The latter plant, as well as other tall herbs, were veiled with dense white spider-webs which were drawn tightly around the foliage. Blown to and fro by the wind of an approaching storm these veiled plants appeared like thousands of shrouded ghosts moving over the wide shore. By collecting quantities of these spider-webs on their horns the wild cattle roaming on the lake-shores all have the appearance of wearing white nightcaps.

The now nearly spent storm, as well as night, overtook us just after we passed through the Okeechobee hammock and light rain accompanied us through the Allapattah Flats. Hungry Land had evidently had a drenching rainstorm, as nearly

all the land, together with the numerous plants mentioned on a preceding page, was submerged. Thus flood and darkness put a stop to further collecting.

Minor investigations were prosecuted when we were not absent from Miami on these extended excursions. Among several localities of interest visited, the region back of Cape Sable may be recorded. We passed through Royal Palm Hammock, where it was gratifying to see the several acres of former forest that was fire-swept and completely destroyed a few years ago, rapidly reforesting itself. Since the custodian of the park cleared the debris from the devastated area within the last two years, the progress of the natural growth has been remarkable. Under Mr. Mosier's guidance we visited a hammock about twenty miles southwest of Royal Palm Hammock. This hammock is somewhat similar to another in the same region, mentioned in a former paper.[1] As we gain more knowledge of the Long Key Pineland and Cape Sable it appears that a disconnected chain of pine-islands and high hammocks connects the two regions, and the intervening territory, when accessible, will doubtless prove an extremely interesting collecting ground.

Our visit to the hammock mentioned above was mainly for the purpose of collecting a peculiar epiphytic fern that had been found there several days earlier. The fern seems to be a species of tropical polypody (*Polypodium Plumula*) with much elongated leaves. These were up to about three feet in length, while they were only between one and two inches wide. The blades were tightly curled, somewhat after the manner of the resurrection-fern, when we found them, and three days' time was required to expand them after they were placed in water.

The spring vegetation of the Everglades was well advanced and the difference between the high and low grounds of the prairie was there more pronounced than had been noticed elsewhere. The lower areas are really natural drainage sloughs; but they are in strong contrast with the deeper sloughs. The latter, in which humus, as well as moisture, collects abundantly support a copious growth of herbs and often also of shrubs, while the former, being shallow and quite even, retain neither humus nor moisture and in addition are subject to frequent

[1] Journal of the New York Botanical Garden **20**: 191–207. 1919.

prairie fires. These are barren or nearly barren in the dry season, and thus stand out in strong contrast with the higher and well plant-clothed parts of the prairies.

The Everglades presented quite a different appearance from what they did six months previously. This was particularly so in the regions where the cypress grew. The distant massive cypress heads instead of presenting a mass of gray branches, showed up as immense green domes, while the stunted, scattered, or spaced pond-cypress on the prairies had been transformed from scraggly spectres[1] into trees with light green foliage and copious tassels of flowers.

Different also was the review of the woods and fields as we sped northward on our return. Summer was there and everywhere, whatever the calendar may have said.

JOHN K. SMALL.

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## SUCCESSION OF ALGAE IN THE GRASSY SPRAIN RESERVOIR[2]

Grassy Sprain Reservoir, the Yonkers City reservoir, is a long narrow lake made by damming a small valley. At the southern end is a spillway with a small stream flowing down over a series of steps. At the bottom a channel extends back obliquely for a hundred yards to the dam, this channel is filled with an almost stagnant backwater. Where the backwater and the overflow stream meet is a spring with a barrel set in it. The water in the spring and in the outlet was open all of the winter of 1919–1920, but the reservoir was frozen over solidly. Efforts were made to collect algae by cutting through the ice but without success. Algae were collected in the spring during February and March and in the spring, backwater and along the south and west sides of the reservoir, twice a month during the remainder of the year.

No attempt was made to classify the numerous diatoms. Numerous desmids were determined but are not considered in the present report. The filamentous green algae were abundant from the time the ice melted in March through July, the largest amounts being found in May and June when large floating

[1] Journal of the New York Botanical Garden **21**: 53. 1920.

[2] Account of report before the Garden conference January 5.

masses of *Mougeotia*, *Zygnema* and *Spirogyra* were common all along the shore. From August through November few green algae were found, but the number began to increase early in December.

Many of the algae had a very short period of growth. For example, *Spirogyra crassa* first appeared early in June at the end of a bay in large masses lying on the bottom. A week later it was still more abundant, the lustrous brilliant green masses covering over half the area of the bay and a few small masses were floating and had been carried out from the bay quite a distance. It continued abundant till near the end of July, when only a little was to be found and that sparingly in fruit. In the first week of August no trace of it could be found.

For six months, from February till July, in the backwater of the outlet there were large masses of *Spirogyra Weberi*, at times filling the channel from side to side. During June these masses became smaller and yellowish in color and by the end of July all had disappeared. In October small masses similar to those found there in the early spring appeared but proved to be *S. fluviatilis*. By January this had increased till it was as abundant as *S. Weberi* had been in March, but no trace of the latter was to be found.

In February the edge of the barrel in the spring of the outlet was fringed with a bright green mass of *Stigeoclonium subsecundum*. It increased in length during the following two months, forming streamers several centimeters in length. In May and June the amount decreased and the plants found showed signs of disintegrating. From the end of June till December none was found except a few short filaments mixed with *Oscillatoria* on the inside of the barrel. In December it again appeared on the edge of the barrel, and by January was as abundant as during the previous February. Whether small particles of the plants had remained attached to the wood or the rhizoid-like holdfasts remained in the pores of the wood, or whether spores of the plant carried it over was not determined, but it seems probable that part of the plant remained on or in the grain of the wood.

Of the blue-green algae some were found every time collections were made. The more or less spherical masses of *Plectonema tomasianum* attached to plants below water or floating

free on the surface were especially abundant in July and August but apparently are present all through the year.

In the early part of August the bottom of the lake was dotted everywhere in shallow water with dark green patches of *Aphanocapsa Grevillei* from which slender threads or streamers, each with an enclosed gas bubble at the upper end, rose to or towards the surface. In the latter part of September similar patches, without the streamers, were composed chiefly of *Cylindrospermum catenatum*, a little of which had formerly been mixed with the *Aphanocapsa*.

About the last of September the lake "bloomed," being covered with dots of *Clathrocystis aeruginosa* so closely as to make the water cloudy. A week later the amount of the little masses was so great that they piled up along the shore, due to wind action, making piles from one-fourth to an inch thick, of the consistency of soft putty and with a disagreeable seaweed odor.

The blue-greens reached their maximum both in numbers and abundance during September. The green algae were most abundant in late May and early June and were in the smallest amount when the others were at their maximum.

G. T. HASTINGS.

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## NOTES, NEWS AND COMMENT

Three species of witch-hazel were in bloom in the fruticetum in February. The most decorative of these is *Hamamelis mollis*, a native of China; its flowers are much larger than in the others and are deliciously fragrant; for horticultural purposes it is much to be preferred. The Japanese witch-hazel, *H. japonica*, also in bloom at the same time, is interesting but its flowers are relatively inconspicuous. The third species, *H. vernalis*, is a native from Missouri and Oklahoma to Louisiana, and in its flowers and blooming time differs materially from the fourth species in the fruticetum, *H. virginiana*, the common witch-hazel of the eastern United States, which blossoms in the late fall and early winter. There is a fifth species, not in the fruticetum collection, recently discovered, *H. incarnata*, from Japan, which differs in having the petals a deep red and the flowers

on long drooping stems. These are the five species known at present: two from Japan, one from China, and two from the United States.

Many of the orchids in flower in conservatory range 2 are assembled in the south end of house 2A. There has been an interesting display during the winter. Since January 1 about 150 species have come into bloom. There is a great diversity in the color, size, and form of the flowers and general appearance of orchids, but the essential character which distinguishes them from all others of the monocotyledons, the uniting into a column of the pistil and stamens, is present in all the flowers.

The large collection of aroids, normally located in house 10 of conservatory range 1, is temporarily placed in house 14 of the same range, pending a renovation of the former house. The center bench in house 14 has been removed, and the larger aroids are placed on the ground or are slightly elevated. In this position the beauty of the plants can be much better appreciated than when on a bench.

A plant of the chocolate tree, *Theobroma Cacoa*, is in fruit in conservatory range 1, house 3. There is a solitary fruit, but it is maturing normally. In this plant the flowers and fruit are borne on the trunk and the bases of the branches, and not, as in most other trees, on the ends of the branches. Each pod contains five rows of seeds, the total content being from fifty to seventy-five seeds, which, when dried, form the chocolate beans of commerce.

Dr. and Mrs. Britton, accompanied by Dr. F. J. Seaver, sailed for Trinidad on February 21, in order to continue the botanical exploration of that island. They expect to return about the first of May.

The following visiting botanists have registered in the library during the winter: Prof. Elmer D. Merrill, Manila, P. I.; Prof. P. J. Anderson, Amherst, Mass.; Prof. C. R. Orton, State College, Pa.; Mr. Charles C. Deam, Bluffton, Ind.; Prof. W. A. Setchell, Berkeley, Cal.; Mr. Ellsworth P. Killip, Mr. E. G. Arzberger, Mr. L. L. Harter and Dr. J. N. Rose, Washington, D. C.; Prof. Alfred H. W. Povah, Syracuse, N. Y.; Prof. W. W. Rowlee, Ithaca, N. Y.; Mr. A. B. Massey, Blacksburg, Va.;

Mr. G. W. Martin and class, New Brunswick, N. J.; Prof. H. M. Fitzpatrick, Cambridge, Mass.; and Prof. Caroline A. Black, New London, Conn.

*Meteorology for February*—The total precipitation for the month was 3.23 inches, of which 1.60 inches (16 inches by snow measurement) fell as snow. The maximum temperatures recorded for each week were as follows: 50° on the 6th, 46° on the 8th, *62° on the 16th*, and 42° on the 22nd, 23rd and 28th. The minimum temperatures were: 15° on the 1st, 25° on the 9th, 12° on the 21st, and *6° on the 25th*.

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## ACCESSIONS

### Plants and Seeds

1 plant of *Iris* for conservatories. (By exchange with Royal Botanic Garden, Regents Park, London.)

1 plant of *Mamillaria erecta*. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)

7 plants derived from seeds from various sources.

1 plant of *Daphne laureola*. (Given by Mr. E. G. Pendleton.)

1 plant of *Thea japonica alba*. (Given by Mr. Jos. Nickel.)

2 plants of Nerium Oleander. (Given by Mrs. Arthur C. James.)

16 plants of *Iris*. (Given by Bobbink & Atkins.)

6 plants of *Iris*. (Given by Vaughans Seed Store.)

56 plants of *Iris*. (Given by the Wing Seed Co.)

2 plants of *Iris*. (Given by Mr. H. W. Groschner.)

13 plants of *Iris*. (Given by Sunnybrook Farm.)

3 plants of *Iris*. (Given by the Mount Desert Nurseries.)

124 orchid plants from Brazil. (Given by Mr. Lee G. Day.)

1 plant of *Iris*. (Given by the Good & Reese Co.)

5 plants of *Iris*. (Given by Mr. Carl Purdy.)

105 plants of *Iris*. (Given by the Van Wert Iris Garden.)

31 plants of *Iris*. (Given by Mr. Robert T. Jackson.)

3 plants of *Iris*. (Given by Mr. H. E. Eckert.)

10 plants of Cacti for conservatories. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)

3 plants for conservatories. (By exchange with Cambridge Botanical Garden, England.)

6 plants of Cacti, for conservatories. (By exchange with Royal Botanic Gardens, Kew.)

1 plant of *Musa Ensete*. (By exchange with Mr. V. Soar, through Dr. J. K. Small.)

86 plants derived from seeds from various sources.

1 packet of seed. (Given by Mr. C. J. Chamberlain.)

2 packets of Cuban seed. (Given by Mr. Mario Calvins.)

2 packets of seed. (Given by Mr. P. D. Barnhart, through Mr. A. T. Delara.)

44 packets of seed, from New Zealand. (Given by Miss E. Mabel Clark.)

1 packet of seed. (Given by Mr. Geo. J. Chryssicus.)

172 packets of seed. (Purchased.)

1 packet of Colombian seed. (Collected by Dr. H. H. Rusby and Dr. F. W. Pennell.)

4 packets of seed. (By exchange with Bureau of Plant Industry.)

116 packets of seed. (By exchange with Botanical Garden, La Mortola, Italy.)

77 packets of seed. (By exchange with Botanical Garden, Berne, Switzerland.)

84 packets of seed. (By exchange with Botanical Garden, Gothenburg, Sweden.)

71 packets of seed. (By exchange with Botanical Garden, Glasnevin, Dublin.)

24 packets of seed. (By exchange with Bureau of Plant Industry.)

118 packets of seed. (By exchange with Botanical Garden, Lyons, France.)

474 packets of seed. (By exchange with Botanical Garden, Edinburgh, Scotland.)

38 packets of seed. (By exchange with Botanical Garden, Upsala, Sweden.)

246 packets of seed. (By exchange with Botanical Garden, Zurich, Switzerland.)

83 packets of seed. (By exchange with Botanical Garden, Groningen, Holland.)

1 packet of seed of *Phormium tenax.* (Given by Mr. Jos. Dixon.)

1 packet of seed. (Given by Mr. H. W. Foulkner.)

2 packets of Trinidad seed. (Collected by Dr. N. L. Britton.)

1 packet of seed. (By exchange with Mr. T. D. A. Cockerell.)

4 packets of seed. (Collected by Dr. N. L. Britton.)

1 packet seed *Penstemon Helleri.* (Collected by Dr. F. W. Pennell.)

1 packet tree fern spores. (By exchange with U. S. Dept. Agric.)

1 packet seed. (Collected by Dr. F. W. Pennell.)

1 packet seed. (Given by Miss Margaret Barrow.)

1 packet seed of *Gentiana crinita.* (Given by Mr. Herbert Durand.)

1 packet of seed of black sesame. (Given by Mr. Wm. Beekley.)

1 packet *Commelina* seed. (Collected by Dr. F. W. Pennell.)

1 packet seed of *Sabal texana.* (By exchange with Mr. R. Runyon, through Dr. J. K. Small.)

## Museum and Herbarium

50 specimens of flowering plants from New York. (By exchange with the University of the State of New York.)

38 specimens of drugs. (Given by Dr. H. H. Rusby.)

28 ; specimens of flowering plants from North America. (By exchange with the United States National Museum.)

6 specimens of woods. (Given by Dr. H. H. Rusby.)

2 specimens of *Limosella* from Colorado. (By exchange with Prof. Ellsworth Bethel.)

11 specimens of fodder plants. (Given by Dr. H. H. Rusby.)

1 specimen of *Galium cruciatum* from New York. (Given by Mr. Wm. C. Ferguson.)

29 specimens of beverages. (Given by Dr. H. H. Rusby.)

6 lantern slides of dahlias. (By exchange with Mrs. C. H. Stout.)

8 specimens of volatile oils and perfumery. (Given by Dr. H. H. Rusby.)

2300 specimens of flowering plants from Trinidad and Tobago. (Acquired by Dr. N. L. Britton.)

7 specimens of spices. (Given by Dr. H. H. Rusby.)

8 specimens of fungi from California. (By exchange with Prof. Ellsworth Bethel.)

2 specimens of sugars. (Given by Dr. H. H. Rusby.)

250 specimens of flowering plants and ferns from northeastern Maine. (Collected by Prof. Harold St. John.)

14 specimens of proximate principles of plants. (Given by Dr. H. H. Rusby.)

161 specimens of flowering plants from Jamaica, West Indies. (By exchange with the Royal Gardens, Kew, England.)

33 specimens of foods. (Given by Dr. H. H. Rusby.)

100 specimens "North American Uredinales" fascicle 23. (Distributed by Mr. Elam Bartholomew.)

5 specimens of fibers. (Given by Dr. H. H. Rusby.)

36 specimens of varnish resins. (Given by Messrs. Pomeroy and Fischer.)

4 specimens of soap products. (Given by H. H. Rusby.)

8 specimens of flowering plants from Oregon. (Given by Professor J. C. Nelson.)

3 specimens of starches. (Given by Dr. H. H. Rusby.)

95 specimens of flowering plants from Montana and Idaho. (Given by Professor J. F. Kemp.)

21 specimens of poisonous plants and insecticides. (Given by Dr. H. H. Rusby.)

15 specimens of flowering plants from Montana, Oregon, and Washington. (Given by Mr. P. H. Hawkins.)

3 specimens of flowering plants from Colorado. (By exchange with Mr. I. W. Clokey.)

121 specimens of mosses from New Zealand. (By exchange with Mr. Brown.)

1 specimen of moss from France. (By exchange with M. Theriot.)

19 specimens from Iceland. (By exchange with Dr. Andrews.)

52 specimens of mosses from North Carolina. (By exchange with P. O. Schallert.)

67 specimens of mosses from California. (By exchange with Dr. C. F. Millspaugh.)

24 specimens of mosses from Minnesota. (By exchange with Prof. J. M. Holzinger.)

25 specimens of mosses from Florida. (Collected by Dr. and Mrs. N. L. Britton.)

1850 specimens of flowering and flowerless plants from Florida. (Collected by Dr. John K. Small.)

1 museum specimen of *Ilex vomitoria* from Florida. (Collected by Dr. J. K. Small.)

40 specimens of Tertiary fossil plants in clay, from Brazil. (Given by Prof. J. C. Branner.)

15 specimens of Tertiary (?) fossil plants in red shale from Trinidad. (Collected by Dr. N. L. Britton.)

2 specimens of shale showing the root-markings of plants in the cleavage planes. (Given by Mr. F. F. Burr.)

13 specimens of fungi from Washington. (By exchange with Prof. S. M. Zeller.).

7 specimens of fungi from Idaho. (By exchange with Dr. J. R. Weir.)

2 specimens of fungi from California. (By exchange with Prof. Ellsworth Bethel.)

1 specimen of *Lophodermium arundinaceum* from Indiana. (By exchange with Dr. H. S. Jackson.)

50 specimens of fungi Rehm, Ascomycetes exsiccati. (Distributed for Dr. H. Rehm.)

1 photograph of *Cordyceps herculea.* (Given by Dr. H. A. Kelly.)

1 specimen of *Calvatia collata* from Utah. (By exchange with Prof. A. O. Garrett.)

2 specimens of *M lanoleuca alboflavida* from Pennsylvania. (By exchange with Mr. H. L. Daddow.)

1 specimen of *Polyporus elegans* from California. (By exchange with Dr. E. P. Meinecke.)

1 specimen of *Psathyra* from the New York Botanical Garden. (Collected by Dr. W. A. Murrill.)

1 specimen of *Funalia stuppea* from Utah. (By exchange with Prof. A. O. Garrett.)

6 specimens of cup fungi from Michigan. (By exchange with Dr. H. M. Fitzpatrick & Geo. Hume Smith.)

5 specimens of cup fungi from New York. (By exchange with Prof. H. H. Whetzel.)

3 specimens of cup fungi from Idaho. (By exchange with Dr. J. R. Weir.)

2 specimens of fungi from local flora range. (Given by Mr. C. A. Schwarze.)

1 specimen of *Chantarel floccosus* from Harrison, Maine. (By exchange with Dr. G. Clyde Fisher.)

1 specimen of *Lachnocladium Schweinitzii* from Arkansas. (By exchange with Rev. H. E. Wheeler.)

1 specimen of *Pterula subulata* from Washington, D. C. (By exchange with Prof. H. H. Whetzel.)

15 specimens of fungi from Yama Farms, New York. (By exchange with Miss Grace O. Winter.)

1 specimen of *Melanoleuca melaleuca* from Arizona. (By exchange with Dr. Walter Hough.)

2 specimens of fungi from Utah. (By exchange with Prof. A. O. Garrett.)

40 specimens of fungi from Buck Hill Falls, Pennsylvania. (By exchange with Mrs. John R. Delafield.)

2 specimens of fungi from Pennsylvania. (By exchange with Dr. L. O. Overholts.)

2 specimens of *Russula compacta* from the New York Botanical Garden. (Collected by Dr. W. A. Murrill.)

25 specimens "Phycomycetes and Protomycetes," numbers 326–350. (Distributed by P. Sydow.)

100 specimens "Uredineen," numbers 2651–2751. (Distributed by P. Sydow.)

25 specimens "Fungi Dakotenses" fasicle 19. (Distributed by Dr. J. F. Brenckle.)

1 specimen each of *Pyropolyporus Bakeri* and *Merulius aureus* from Pennsylvania. (By exchange with Dr. L. O. Overholts.)

1 specimen of *Cycloporus Greenei* from Kentucky. (By exchange with Prof. Bruce Fink.)

1 specimen of *Lactaria atroviridis* from New Jersey. (By exchange with Dr. D. L. Millspaugh.)

1 specimen of *Fomes roseus* from Michigan. (By exchange with Dr. D. R. Sumstine.)

6 specimens of fungi from Wyoming. (By exchange with Mr. Simon Davis.)

1 specimen of *Lactaria theiogala* from New Jersey. (By exchange with Dr. D. L. Millspaugh.)

1 specimen of *Clavaria byssiseda* from North Carolina. (By exchange with Dr. W. C. Coker.)

2 specimens of fungi from California. (By exchange with Prof. H. E. Parks.)

2 species of fungi from Canada. (By exchange with Rev. Dr. Robert Campbell.)

1 specimen of *Marasmius* from the New York Botanical Garden. (Collected by Miss M. E. Eaton.)

10 specimens of fungi from New York. (By exchange with Mr. W. H. Ballon.)

8 specimens of fungi from Oregon. (By exchange with Prof. S. M. Zeller.)

1 specimen of *Wynnea americana* from Pennsylvania. (By exchange with Mr. C. E. Chardon.)

1 specimen of *Clavaria fusiformis* from Alaska. (By exchange with Dr. N. M. Cook.)

10 specimens of fungi from Jamaica. (By exchange with Mr. W. R. Mayon.)

1 specimen of *Clavaria* from Big Cottonwood, Utah. (By exchange with Miss Violet Barrows.)

33 specimens of fungi from Oregon. (By exchange with Mr. J. S. Boyce.)

1 specimen of *Lachnea scutellata* from Connecticut. (By exchange with Prof. A. H. Graves.)

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The contribution of $25,000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a benefactor of the Garden.

## 2. Patrons

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OF

# The New York Botanical Garden

EDITOR

R. S. WILLIAMS

*Administrative Assistant*

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## THE LEAFY SPURGE BECOMING A PEST

About one hundred years ago, possibly even earlier, the Leafy Spurge, native of Europe, obtained a foothold in Essex County, Massachusetts; the actual date of its introduction is not definitely known, but a specimen preserved in the Torrey Herbarium of Columbia University, deposited at the New York Botanical Garden, was collected at Newbury, Massachusetts, by William Oakes in 1827. Oakes, who was a keen botanist, annotated the label of the plant sent to Dr. Torrey, "I want to find this at another place; have you met with it, or heard of it?" For many years it was known nowhere else in the United States, but in the first edition of Gray's Manual of Botany, published in 1848, the learned author remarked that it was likely to become a troublesome weed. John Robinson in his "Flora of Essex County, Massashusetts" (1880) records it as "very abundant near Newburyport on the line of the eastern R. R.;" this is probably Oakes' locality. In his "Cayuga Flora," published in 1886, Professor W. R. Dudley records the plant as found at Groton, New York, in 1875, remarking on its rarity. In the Catalogue of Plants of Michigan by C. T. Wheeler and Erwin F Smith (1881), it is recorded as escaped from cultivation and infrequent in that state. In the sixth edition of his Manual, published in 1889, Dr. Gray added these western New York and Michigan records to its known distribution, remarking, however, that it was rare. In the first edition of Illustrated Flora (1897) I recorded its distribution as Massachusetts to New York and Michigan; by the time the second edition was published (1913) it had extended to Maine, Ontario and New Jersey; it is only in recent years, however,

that Dr. Gray's surmise of 1857 has become a fact, and farmers in Orange County, New York, and elsewhere now find this weed a menace to pastures; measures for its reduction or eradication are being taken, but the task is not an easy one, and the matter is of sufficient importance to have brought out editorial comment in the New York Herald on February 9, 1921.

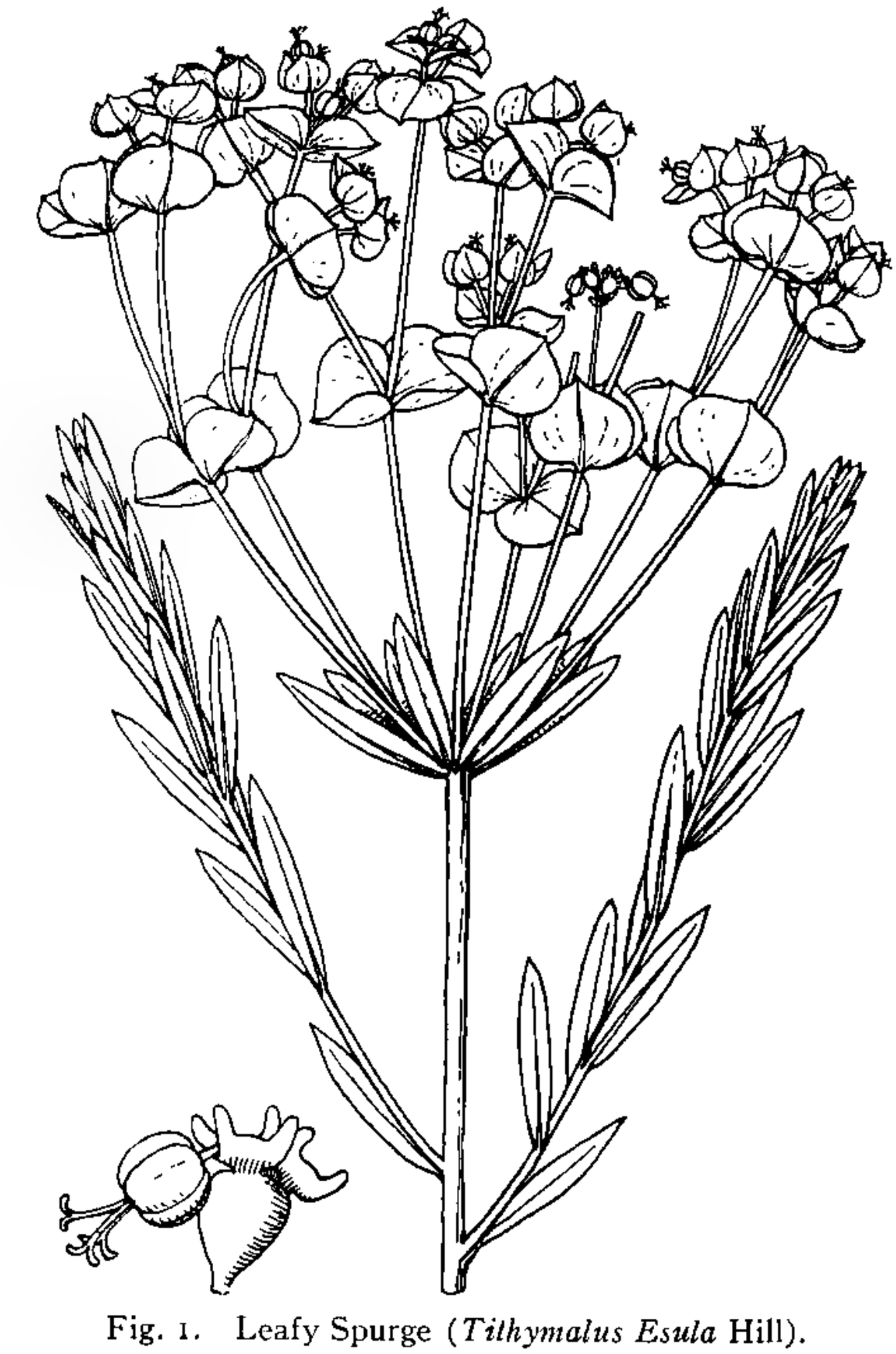

Fig. 1. Leafy Spurge (*Tithymalus Esula* Hill).

The Leafy Spurge, also known as Faitour's Grass and Tithymal (*Tithymalus Esula* Hill, *Euphorbia Esula* Linnaeus), native of Europe, is a perennial herb, usually about one and one-half feet high, with narrow leaves about two inches long or less, those on the stem few, those on branches close together, the

uppermost in a verticil subtending a several-rayed umbel of small flowers and large broad bracts. The plant has horizontal rootstocks from which it grows year after year, and these make its control as a weed very difficult.

The accompanying illustration will help to identify the species; if detected it should be forked or spaded out of the ground and burned, taking care to get all its underground parts.

While often regarded botanically as a species of *Euphorbia*, the plant is quite different from the tall and fleshy, cactus-like, true Euphorbias of Africa, a collection of which may be seen in our Conservatory Range 1, House 5.

N. L. BRITTON

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## TROPICAL TREES WITH LIGHT-WEIGHT WOOD.*

During the last three years the writer has had very favorable opportunities to study light-weight woods in the forests and jungles of Central America. The wood of species of *Ochroma*, known commercially by the Spanish name "Balsa," has, in the last decade, come into prominence as a material for purposes of buoyancy and insulation. *Ochroma* is exclusively a genus of the American tropics. It grows in the West Indies but not in Florida. It is found in southern Mexico and from these northern limits extends to northern Bolivia.

*Ochroma* is by no means, however, the only genus that contains species with light-weight wood. There are several other genera in the same family (Bombacaceae) with light wood, notably some species of *Ceiba*, and all, so far as known, of the species of *Cavanillesia*. However, some representatives of the family have relatively heavy, hard wood, as for example, *Bombax ellipticum* and species of *Pachira*. Light-weight woods are to be found in other families, as in the genus *Wercklea* (Malvaceae) *Heliocarpus* (Tiliaceae), *Cordia* (Borraginaceae) and *Erythrina* (Leguminosae). Perhaps the most remarkable of all is the wood of the Caricaceae and particularly of the genus *Jacaratia*, which is so soft that it would be more appropriate to call it a vegetable substance rather than a wood. Its stature,

* Abstract of address before the Conference of the Scientific Staff and Students of the Garden in February.

bark and growth in thickness by a true cambium layer, however, warrant its being considered a tree.

One of the many remarkable features of tropical vegetation is the fact that the heaviest and lightest woods are, locally, often immediately associated.

Light-weight woods fall into two categories: first, those where the elements are arranged in a relatively homogeneous mass, and second, those where soft parenchymatous masses alternate with more or less continuous bands of thick-walled fibrous tissue. The first is Homogeneous, the second Laminated wood, as distinguished in the following discussion. *Cochlospermum*, *Erythrina*, and in the most extreme degree, all the Caricaceae, have laminated woods. The nearest approach to this type of wood in northern latitudes is in the Juglandaceae, where as is well known, very thin bands of parenchyma occur in the annual rings. In many tropical trees the greater portion of the mass of wood is composed of soft parenchyma. On the other hand, homogeneous woods have no conspicuous segregation of parenchymatous masses and sclerenchymatous fibers. Typical of this are all our northern woods, with the possible exception mentioned above, and the soft woods of the tropics, *Ochroma*. *Wercklea*, *Bombax* and *Cordia*.

Three genera have been selected to illustrate types of light woods. *Ochroma* and *Cavanillesia* of the Bombacaceae and *Jacaratia* of the Caricaceae, in which genera, so far as known, all the species have light-weight wood.

OCHROMA—In the United States the wood of this genus is best known by the name "Balsa," but by Spaniards and the aboriginals in the tropical countries, by many other names.

In the Tropical Rain Forest Region the balsa attains its largest size and greatest abundance. Trees a meter in diameter are frequently seen. The leaves of young trees are much larger and thinner than in old trees and the wood found in the juvenile state is noticeably lighter than that of the senile state. In the tropics the trees flower and fruit at the age of two to three years. The average growth in diameter under favorable conditions is rapid, not far from 5 inches per year during the juvenile state. The wood ranges in weight from 4 to 12 pounds per cubic foot. The heart wood is homogeneous, silvery-white to pink. The sap wood is always white. There is a semblance

of annual rings frequently, but they are irregular in occurrence and are in all probability due to variations in climate which do not occur with much regularity.

CAVANILLESIA.—In Panama these trees are called "Quipo" and in northwestern Colombia, "Macondo." There are two species in South America, one in the east and one in the west. The Brazilian tree is called "Barraguda" by the Portuguese and Bottle Tree by the English. (A picture of it is shown in Schimper's *Plant Geography* p. 361.) The Panama tree is *C. platanifolia*. It attains immense size. The branches and leaves are at the very top of the tree and the trunks simulate great columns. The strength of the trunks is principally in the thick fibrous bark. The wood is even lighter than Balsa. It is so fragile however, that it crushes more or less as the tree falls. It is homogeneous but a large percentage of the wood is parenchyma. The wood is so porous that air can readily be forced through it longitudinally. The large trees appear to be of great age, but our surmise is that they are rapid growers and by no means as old as they look.

JACARATIA.—With the exception of one anomalous species in Mexico, this genus has heretofore been considered as confined to South America east of the Andes. In 1920 specimens were found in Panama and Costa Rica. The tree greatly resembles a *Ceiba* and may have been mistaken for it. The fruit is characteristic of the Papayas. The wood of the tree is very soft and spongy. After a portion of the bark was cut away a machete could be shoved to the center of the trunk with comparative ease. The wood is laminated. The parenchyma bands are very thick and constitute at least nine tenths of the mass of wood. The wood when fresh can be cut into blocks as one would cut up parsnips or turnips. Balsa and Quipo do not shrink excessively when dry, but the wood of Jacaratia when dried shrinks to a mere fraction of its original bulk. It is said that the wood of the South American trees is poisonous when eaten.

There appears to be certain concomitant features attending trees with light wood somewhat as follows:

1. Geographically they are confined principally to the Tropical rain forest region and to the belt of equatorial calms.

2. They are plants with a very extensive leaf surface.
3. Thick, fibrous bark characterizes most of them.
4. Their wood is white or at least very light in color.

W. W. ROWLEE

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## SPRING AND SUMMER LECTURES

An attractive series of public lectures on botanical and horticultural subjects will be given in the Lecture Hall of the Museum Building on Saturday and Sunday afternoons at four o'clock as listed below. Most of them will be illustrated by lantern slides. In addition to the two floral exhibits here announced, there will be one early in June devoted to roses, the exact date of which can not be fixed at this time.

April 30. Botanizing on a Volcano, Dr. H. A. Gleason.
May 1. Spring Flowers, Dr. N. L. Britton.
May 7. The Rôle of Plants in Man's Evolution, Dr. W. A. Murrill.
May 8. Window Gardens for City Homes. Mr. Van Evrie Kilpatrick.
May 14. Mountaineering in the Northwest, Mr. Leroy Jeffers. (Exhibition of flowers, May 14 and 15)
May 15. Plant Hybrids, Dr. A. B. Stout.
May 21. Water-lilies and How to Grow Them, Mr. G. V. Nash.
May 22. Practical Hints for Home Gardeners, Mr. Hugh Findlay.
May 28. Bog Vegetation at Cranberry Lake, Prof. W. L. Bray.
May 29. Why Study Nature?, Dr. W. A. Murrill.
June 4. Sea Gardens of the Tropics, Dr. M. A. Howe.
June 5. Collecting in the Rocky Mountains, Dr. F. W. Pennell.
June 11. How Nature Scatters Seeds, Dr. G. C. Fisher.
June 12. The Origin of Plant Life, Dr. W. A. Murrill.
June 18. Destructive Insects, Dr. F. J. Seaver.
June 19. The Vegetation of Long Island, Mr. Norman Taylor.
June 25. Books on Gardening, Dr. J. H. Barnhart.
June 26. Color in the Garden, Miss Emily Exley.
July 2. Floral and Scenic Features of Haïti, Mr. G. V. Nash.
July 3. The Glory of the Annuals, Mr. Arthur Herrington.
July 9. The Golden Mean in Nature, Dr. W. A. Murrill
July 10. Planning and Planting the Home Grounds, Mr. H. D. Hemenway.
July 16. Immunity to Disease in Plants, Dr. W. A. Murrill.
July 17. Wild Flowers, Dr. H. D. House.
July 23. Some American Botanists, Dr. J. H. Barnhart.
July 24. The Significance of Sex in Plants, Dr. W. A. Murrill.
July 30. Summer Garden Flowers, Mr. G. V. Nash.
July 31. How Plant Life Will Cease, Dr. W. A. Murrill.
August 6. Botanical Cruises in the Bahamas, Dr. M. A. Howe.
August 7. The Care of the Vegetable Garden, Mr. Hugh Findlay.
August 13. Impressions of the Colombian Andes, Dr. F. W. Pennell.

August 14. Some of Our Common Food Plants. Dr. M. T. Cook.
August 20. Evergreens and How to Grow Them, Mr. G. V. Nash.

(Exhibition of Gladioli, August 20 and 21)

August 21. The Position of Plants in the System of Nature, Dr. W. A. Murrill.
August 27. Colorado, Dr. F. J. Seaver.
August 28. The Origin of Cultivated Plants, Dr. A. B. Stout.

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railroad to Botanical Garden Station, by trolley cars to Bedford Park, or by Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue. Those coming by the New York, Westchester and Boston Railway change at 180th Street for crosstown trolley, transferring north at Third Avenue.

W. A. MURRILL

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## CONFERENCE NOTES FOR MARCH

The March conference of the Scientific Staff and Registered Students of the Garden was held in the museum building on Wednesday, March 2, 1921, at 3:30 P. M.

The program was as follows: "Remarks on Fossil Algae" by Dr. Marshall A. Howe and "Rubber Content of North American Plants" by Dr. H. M. Hall.

Dr. Howe reviewed the few papers in which American fossil algae have been described, and exhibited specimens of "nullipore limestone" from Trinidad and Santo Domingo, sent for determination by Dr. T. Wayland Vaughan of the U. S. Geological Survey. Two specimens from Trinidad (Lower Miocene), of which photomicrographs were exhibited, were considered to represent two undescribed species.

A fossil organism of a different character was recently collected by Mr. William J. Sinclair of Princeton University, in the fresh-water Oligocene of the "Bad Lands" of South Dakota. It forms extended, laminated, calcareous crusts or smaller concretions with concentric lamellations. Its microscopic cell-

ular structure is very imperfectly preserved and a student of modern algae would hardly feel justified in going further than to say that this South Dakota fossil probably represents the remains of some lime-depositing blue-green alga comparable with some now living in certain lakes of central New York and in Little Conestoga Creek, Lancaster County, Pa.

The speaker discussed especially fossil organisms from the Cambrian and Pre-cambrian that have been referred to the algae by Dr. C. D. Walcott and also other ancient fossils of a probably algal nature that have been known under the generic name *Cryptozoon* as well as others of more doubtful affinities that constitute the genus *Solenopora*.

Dr. H. M. Hall spoke very interestingly on the rubber content of various native North American plants, a matter which Dr. Hall with associates, has had under special investigation during the past few years. It has been found that rubber of good quality can be obtained from various species of *Chrysothamnus* and *Haplopappus* of the Aster Family of plants. One species, *Chrysothamnus nauseosus*, commonly called rabbit-bush, is a large shrub that grows abundantly over the semi-desert areas of Colorado, Nevada and Utah. The present stand of the varieties of this species would yield, it is estimated, about 300,000,000 lbs. of good rubber. This rubber could not be obtained at a price that could compete with the rubber produced from the tree, *Hevea braziliensis*, which is grown in the tropics, but under the stress of national emergency in war time conditions, the supply available might become a valuable asset.

The possibility of improving native rubber-bearing plants is being considered. The rabbit-bush can be grown without irrigation on waste and alkaline lands of the western states. Some varieties of it withstand winter temperatures of —20° F., and other varieties endure extreme summer heat. The plant appears to be a most promising species for use in any attempts that are to be made in the establishment of a rubber-growing industry in the United States.

Dr. Hall also reported on preliminary studies of the rubber content in many other species, especially of the Dogbane and Milkweed families.

A. B. STOUT
Secretary of the Conference

## NOTES, NEWS AND COMMENT

A guide to nature-study and school garden opportunities in New York City, prepared by a committee representing the local institutions and agencies interested in nature and garden education and edited by Van Evrie Kilpatrick, was recently published by the School Garden Association of New York. This interesting and valuable publication informs superintendents, principals, and teachers regarding the resources for nature-education in our city, which are greater than those of any other city in the world. It explains where and how teachers may get instruction, materials, charts, pictures, lantern slides, equipment, and literature for their daily teaching; shows where teachers may take courses in science, nature, and gardening; where they may attend special lectures on these subjects; and how such lectures may be secured for a given school or community. It describes how pupils may work effectively, how classes may visit institutions, parks, greenhouses, gardens, fields, and many other points of nature contact; how they may use school grounds, make nature collections, use the public libraries, work in school gardens, get nature material, see nature exhibits, and secure credits through awards. The cordial spirit of cooperation that has characterized this undertaking from the beginning is a source of great promise for the future growth of true nature education. (W. A. M.)

An underground gasteromycete, apparently a species of *Hysterangium*, was brought in about the middle of February by Mr. L. Robba, who collected it with a trained truffle dog under an oak tree near White Plains, New York. The soil was not frozen hard because of the mild weather and a layer of two or three inches of leaves, but the tiny "puffballs" were frozen and made very poor specimens when dried. The spores were rather rough, ovoid, and distinctly umber-brown under a microscope. Mr. Robba naturally thought they were truffles, but he did not notice any odor, and he recalled that his dog was not particularly "interested" in the find, only scratching a little to mark the spot and then walking away. The plants were unearthed by scraping off the covering of leaves and digging about two inches into the soil. There must have been *some* odor present, otherwise the dog would not have been attracted. (W. A. M.)

In the central display house, conservatory range 2, there was a fine display of flowering bulbs and other plants for Easter. Daffodils, tulips, hyacinths, hippeastrums, and squills lent a great show of color. Other flowers were *Primula malacoides* and its white variety, *P. obconica*, and *P. kewensis*, azaleas and Forsythias. This display has been continued for some weeks.

The large bottle-brush tree, *Callistemon citrinus*, is in full bloom in the central display house, conservatory range 2. It is covered with hundreds of its cylindric, bright red flower-clusters, from which the tree derives its name. There are other plants of *Callistemon* also coming into bloom. *Acacia pulchella* and *A. hispidissima* are covered with a wealth of bright yellow blossoms, the last of the species in the collection to flower.

Out-of-doors everything is one to two weeks in advance of the usual time, owing to the wonderful spring-like weather which has prevailed, some days the heat even touching that of summer. It was necessary to uncover the large collections of tulips about two weeks ahead of the usual time to prevent the plants drawing too much. The Forsythias form masses of gold all over the grounds, great masses greeting the eye in all directions. They are unusually fine this season, the group of *Forsythia intermedia* near the elevated railroad approach and the large mass near the Harlem Railroad depot being especially imposing. In the flower beds at conservatory range 1 the Siberian squills seems never to have been so blue before, and the vividness of the glory-of-the-snow, *Chionodoxa Luciliae*, is striking. Crocuses, purple, lilac, yellow and white, are in abundance, and the daffodils are just beginning to show their blossoms.

In the fruticetum are more masses of *Forsythia*, rivalling those to which allusion has already been made. And nearby are the Cornelian cherry, *Cornus Mas*, and the Sandzaki, *Cornus officinalis*, a Japanese relative of the other, the latter, if anything, the more striking of the two. That sweetest of the early honeysuckles, *Lonicera fragrantissima*, is in full bloom, not only here but in many other parts of the grounds. *Magnolia Kobus* is a mass of bloom, and the willows nearby are sending out myriads of "pussies." (March 29, G. V. N.)

It may be of interest to know that the following species were in bloom in the Botanical Garden grounds on or before March 21st.

Crocuses
Siberian Squill
Glory-of-the-snow
Honeysuckles, two species
Dogwood, two species
David's Peach
Buffalo-berry
Forsythia, two species
Spice-bush
Coltsfoot
Mountain Spurge
*Adonis amurensis*
*Jasminum nudiflorum*

Miss Wakefield, the well-known Mycologist of Kew Gardens, England, arrived in New York on March 10, after spending the winter collecting in the British West Indies. On March 19, she left for a tour through parts of the Eastern United States, and will sail for England in May. Her chief interest at the Garden was the large collection of polypores from the American tropics.

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## ACCESSIONS

### LIBRARY, FROM NOV. 1, 1920, to JAN. 31, 1921

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Vol. 21, part 1, 1916; part 2, 1917; part 3, 1918. Chenopodiaceae—Allioniaceae.

Vol. 22, parts 1 and 2, 1905; parts 3 and 4, 1908; part 5, 1913; part 6, 1918. Podostemonaceae—Rosaceae.

Vol. 24, part 1, 1919; part 2, 1920. Fabaceae (pars).

Vol. 25, part 1, 1907; part 2, 1910; part 3, 1911. Geraniaceae—Burseraceae.

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Vol. 32, part 1, 1918. Rubiaceae (pars).

Vol. 34, part 1, 1914; part 2, 1915; part 3, 1916. Carduaceae—Anthemideae.

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EDITOR

R. S. WILLIAMS

*Administrative Assistant*

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# FURTHER BOTANICAL STUDIES IN TRINIDAD[1]

TO THE SCIENTIFIC DIRECTORS OF THE NEW YORK BOTANICAL GARDEN.

*Gentlemen*: Pursuant to permission granted by the Board of Managers, I have continued botanical study and collecting in Trinidad, British West Indies, leaving New York on February 21, 1921, and returning on April 25, travelling both ways on steamers of the Trinidad Line.

The objects of the trip were to supplement observations and collections made by us in Trinidad a year ago as another contribution to the investigation of the flora and plant products of northern South America and adjacent islands prosecuted by The New York Botanical Garden, The Gray Herbarium of Harvard University and The United States National Museum. Mrs. Britton accompanied me; also Dr. Fred J. Seaver of our curatorial staff, Professor Gilbert van Ingen, of Princeton University, with Mrs. van Ingen, and through their aid a large collection was brought together, supplementing the one made last year. Miss Margaret S. Brown, of Halifax, Nova Scotia, joined us about two weeks after our arrival, and rendered efficient aid in collecting and preserving specimens, and made water color studies of several flowering plants. Mr. W. G. Freeman, Director, and Mr. W. Nowell, Assistant Director of Agriculture, Mr. W. E. Broadway, Assistant Botanist, Mr. F. W. Urich, Entomologist, and other members of the Trinidad Department of Agriculture aided us in many ways, and Miss Minerva Hart, Librarian of the Public Library at Port of Spain, was continuously helpful on all occasions.

[1]Journ. N. Y. Bot. Gard. **21**: 101. 1920.

Dr. Seaver paid especial attention to the fungi, and the series of specimens obtained by him will, after study, form the basis of noteworthy contributions to the mycology of tropical America. Professor van Ingen secured a series of fossil plants from the Siparia quarry mentioned in my previous narrative,[1] and other specimens from vertically-bedded soft sandstone strata on the southern coast near Moruga; the study of this material, together with that collected by me a year ago, should yield important information about plants presumably now extinct, but an exhaustive investigation of Trinidad palaeobotany requires prolonged residence in the vicinity of the outcrops; he also took many photographs.

Our studies and collections were made for the most part at different localities than those visited last year, but several of the savanna areas and parts of the Bocas Islands were reexamined in search of rare species or for more complete specimens of species formerly collected. We arrived at Port of Spain on the evening of March 1; the next two days were given to studies in the Botanical Garden and the Herbarium. On March 4, we made collections in the lowland forests at Arima and near Valencia, where, on a sandy bank, a fine colony of the rare sedge *Diplacrum longifolium* was found, interesting because its capitate inflorescence simulates that of northern bur-reeds (*Sparganium*). Here we also saw for the first time, the curious sedge-like *Rapatea*, its small flowers nearly enclosed in flattened spathes, its long, narrow leaves arranged in beautiful spirals simulating those of small screw pines (*Pandanus*). Several interesting ferns and mosses were also obtained in this Valencia forest, together with many fungi. March 5 was given to care of collections and to herbarium studies. On March 6, under the guidance of Mr. W. G. Freeman, Director of Agriculture, we explored forest areas at Brazil and near Talparo. The rare small tree *Cymbopetalum* of the Sugar-apple Family was found both in flower and in fruit, its long-stalked, drooping, white flowers remarkable and characteristic; here Mrs. Britton detected a very rare little leafless pink-flowered species of *Leiphaimos* of the Gentian Family, growing in the forest mould, but prolonged search revealed only a few individuals of this highly interesting species. Two days

[1] Journ. N. Y. Bot. Gard. **21**: 112. 1920.

were here given to care of collections and herbarium studies. Manzanilla on the eastern coast was visited on March 9 and studies made of the strand vegetation, and that of coastal woods and thickets toward Manzanilla Point. The seabeach extends southward for many miles, backed by very extensive coconut groves, here as usually on coastal sand dunes, in luxuriant condition. The strand vegetation of Trinidad is meagre in species as compared with that of beaches in Florida and the northern West Indies, and all its elements are of wide tropical distribution; the marine algae are also few. A coastal hill, underlaid by decayed limestone, supported a luxuriant growth of the Silver Palm (*Coccothrinax*) and magnificent trees of the Cabbage Palm (*Roystonea oleracea* or *Oreodoxa oleracea*), here evidently in a truly wild condition. Dense thickets of the Trinidad *Furcraea* with green, shining, spinulose leaves 6 or 8 feet long indicated this as its natural habitat. Several interesting coastal trees and shrubs provided specimens for subsequent study and the banks of a river were very attractive. Matchepoorie Hill, one of the prominent elevations of the central range, was studied on March 11. This is a mass of hard limestone, quarried for road-metal, and full of fossil corals and mollusks, which provided Professor van Ingen with geological specimens. It is partly covered by a luxuriant forest; a recently fallen tree yielded us a goodly supply of orchids, including the distichous-leaved *Lockhartia*, dedicated to David Lockhart, the founder of the Trinidad Botanical Garden, and the forest *Smilax* was found bearing ripe black berries. Professor L. H. Bailey, who had been prosecuting botanical studies in Venezuela, assisted by his daughter, Miss Ethel Z. Bailey, arrived at Port of Spain from the Orinoco Delta at this time; they accompanied us on several excursions. On March 12 we studied the dry woodlands on Point Gourde, from Hart's Cut toward Belle View; here, in a ravine we saw many young plants of the Carat Palm (*Sabal mauritiaeformis*), which we had supposed to be restricted in distribution to forests of the central and southern parts of Trinidad.

A most successful and altogether enjoyable excursion was made on March 13 to Morne Bleu, in the northern mountain range north of Arima, under the guidance of Mr. Freeman. Here the mountain forest is very extensive, at altitudes from 1500 to over 2000 feet, and rich in species of many kinds of

plants. Wet banks were covered with the little purple-flowered *Marssonia* of the Acanthus Family, associated with many kinds of mosses and ferns. Giant *Pteris* ferns fifteen feet high grow along mountain brooks and several species of tree-ferns are abundant. An evidently rare, yellow-flowered, low plant of the Foxglove Family, detected here by Mr. Freeman on a previous visit, was seen along a road[1]. Among trees, *Alchornea glandulosa* of the Spurge Family, with delicate drooping tassels of green flowers and a species of the Myrtle Family with large thick leaves and oblong fruits an inch long were of especial interest. Dr. Seaver secured many fungi in this forest. The next day was wholly required for the care and preservation of the specimens collected at Morne Bleu.

A visit was made with Mr. W.E. Broadway, Assistant Botanist of the Department of Agriculture, on March 15 to the Piarco Savanna, south of Arouca, where the rare herbaceous *Hyptis melanosticta*, not seen by botanists since its original collection in 1847, was found, to our great satisfaction, and good specimens obtained along a forest border. On March 16 a long to be remembered visit was made to the mountain forest on the slopes of the Heights of Aripo, accompanied by Mr. Freeman and by Mr. F. W. Urich, Entomologist of the Department of Agriculture. Mr. Urich had previously explored this district and he made arrangements for guides and bearers with Mr. L. S. Dade, to whom and to Mrs. Dade we are further indebted for delightful hospitality. The ascent was made through cocoa plantations, meeting the forest at about 1200 feet elevation and traversing it to above 1800 feet; near the mouth of a cave inhabited by the guacharo bird, Mr. Urich led us to one of the most elegant wild plants of tropical America; it is a woody climber of the Blueberry Family (Vaccininiaceae) and in bloom its branches are covered with tubular, scarlet flowers about an inch long with a short white limb; its exact botanical relationship is to be determined; as a species it is apparently new to science, and it is a noteworthy addition to the known flora of Trinidad. Another plant of much interest is the small tree *Schoenobiblos grandifolia* the only Trinidad representative of the Thymeleaceae; it is

[1] Dr. Pennell has identified it as *Tovenia Thouarsii*, not hitherto known from Trinidad.

dioecious, both kinds of flowers in round heads, and we were fortunate in securing good specimens of both. Locally the forest was suffused with delightful fragrance of *Mollinedia* flowers, small and yellow, borne on medium-sized trees; ferns, mosses and hepatics were everywhere in great abundance and variety and many fungi were obtained.

On March 18 collections were made in the forest at Arima. On March 19 we drove with Mr. Broadway to the southern coast at Moruga, four hours by motor-car, spent five hours studying forest and coastal thickets, and reached Port of Spain at nine in the evening. Our five hours collecting yielded us specimens of many interesting vines, trees and shrubs; one of the vines (*Arrabidaea oxycarpa*) growing on trees on a coastal bank, a relative of our northern Trumpet-creeper, is confined to this habitat so far as known; we obtained specimens showing its long, flat, narrow, sharply pointed pods; a fine purple-flowered *Vernonia* grows on a coastal bluff; in the forest we found good specimens of the white-flowered *Ipomoea sericantha*, the corolla characteristically hairy. Much of the forest here is composed of the Jigger-tree (*Bravassia*), very conspicuous through its masses of small white flowers, and highly interesting as an arboreous member of the Acanthus Family.

On March 20 we went to Point Cumana, on the western coast, to restudy the tall, prickly aroid *Montrichardia* which lives in brackish soil bordering mangrove swamps, an unusual habitat for a species of its family, and we were fortunate in finding it both flowering and fruiting. Another visit was made to the Piarco Savanna on March 21, and we revisited the O'Meara Savanna on March 22; on these savannas we were in search for two small herbaceous plants collected there some years ago, but we were unable to find them; they may perhaps be in evidence at another season of the year; we were rewarded, however, by finding the low spurge *Chamaesyce hyssopifolia*, not heretofore recorded as inhabiting Trinidad. Two days were now given to herbarium studies and care of collections. On the afternoon of March 24 we changed our base of operations from Port of Spain to Las Lilas, a country estate of Mr. J. W. Stephens in the Montserrat Hills, which Mr. Stephens had kindly placed at Mr. Freeman's disposal for scientific purposes. Mr. Freeman accompanied us; also Mr. W. Nowell, Assistant Director of Agriculture,

and Mrs. Nowell. Las Lilas proved a comfortable and convenient place for the study of several districts. On March 25 we studied the high dense forest along the Guayaguayare Road southeast of Rio Claro. Here we were in the area of the tallest forest of Trinidad, with rich soil and high rainfall. The mora trees are especially impressive, and their large, oblong pods containing 1 or few seeds with immense cotyledons are most interesting. As in other mora forests visited, seedling trees are very abundant. A shrub, apparently of the genus *Psychotria* (Rubiaceae), with clusters of bright blue fruits, is beautiful and conspicuous. Three species of epiphytic Gesneriaceae grow on small trees; the trailing vine *Geophila* (Rubiaceae) grows on the forest floor. *Hippocratea*, a woody vine, with curious flattened fruits, climbs high and several Philodendrons and other aroids festoon the trees, their pendulous aerial roots sometimes drooping to the ground; many mosses, hepatics and fungi were collected here. The forests near Tabaquite were studied on March 26 and March 28. A species of *Bauhinia*, a long woody vine of the Cassia Family, climbing high, bore conspicuous masses of white flowers. The beautiful bromeliad, *Hohenbergia stellata*, with panicled heads of blue flowers grows on many trees. We first saw at this locality the remarkable *Uncaria*, a long woody vine of the Rubiaceae with capitate green flowers, its branches armed with opposite, hooked prickles. On March 27 coastal marshes and thickets were studied at Couva Bay and at Monkey Point. We are indebted to Mr. Stephens for the use of Las Lilas; return was made to Port of Spain on the evening of March 28, and the two following days were given to care of the collections for the most part.

Point Gourde, on the northeastern coast, was visited with Mr. Broadway on March 31 and studies of the vegetation of coastal banks and rocks were made. The two following days were given to garden and herbarium studies, and in the afternoon we transferred our base to Gasparee Island, remaining there until April 7 using the power-launch Marie for visits to the Bocas Islands, making collections supplementary to those obtained on these islands a year ago. On April 3 we went to Chacachacare Island escorted by Mr. Freeman and Mr. Nowell, and we also had the pleasure on this excursion of the company of Sir Francis Watts, Imperial Commissioner of Agriculture for the West Indies, who

had come from Barbadoes to attend an intercolonial educational conference at Port of Spain. Owing to continued rainfall the vegetation was far more luxuriant than in April 1920, and many more plants were in bloom; the fragrance of several kinds of flowers was noteworthy. A pink-flowered *Malpighia*, a small tree, was in full bloom; the white-flowered Cucurbit *Ceratosanthes palmata*, an herbaceous vine, its beautiful corolla with wrinkled lobes, is abundant at lower elevations; we were delighted when Dr. Seaver found a wide-open flower on the *Passiflora* of this region, white with a double purple-and-white-banded crown, its stem with thin, corky wings; we had seen the foliage of this fine species on Patos Island, and later observed the plant on Monos and on Gasparee. The small tree *Ouratea Guildingii* was covered with its small golden-yellow flowers, growing near the purple-flowered *Petræa arborea*, the "West Indian Lilac." The shrub *Erythoxylon ovatum*, a relative of Coca, was covered with small white flowers, in effect like our northern Beach Plum, and fine flowering specimens were secured of the rare tree *Coccolobis fallax*, a near relative of the Sea Grape. Many other interesting plants were collected on this excursion and the day was a most successful one. We were again indebted to Captain Mendes and Mrs. Mendes, at La Tinta, for aid and gracious hospitality.

On April 4 we landed at Domas Bay, Monos Island, and traversed the western part of that island, finding much of interest. A colony of the tall *Abutilon giganteum*, a slender tree up to 20 feet high, with yellow flowers, provided us with excellent specimens; the velvety-leaved *Peperomia* of this flora was abundant and finely developed; a yellow-flowered *Bromelia* was altogether new to us and quite unexpected, as was also a small gnarled tree of a species of *Elaphrium* (Burseraceae), growing on the rocky western point. A few mosses and hepatics were found. We again visited Chacachacare on April 5, ascending to the lighthouse on its summit as before, a climb of some 800 feet, then down to the sea on the western side through the bed of a watercourse in a deep valley, then up to the lighthouse again and back to the launch at La Tinta. This walk showed that the forest on this side of the island was taller and more varied in species than we had supposed. Collections were made on Gasparee Island and on Little Gasparee on April 6, and we returned to Port of

Spain on April 7, in time to attend the reception of His Excellency Sir John Chancellor and Lady Chancellor to the delegates of the Intercolonial Educational Conference at Government House, taking advantage of this delightful occasion to study the charming gardens there.

On April 8 we drove with Mr. Broadway to Siparia, and close to the quarry where Professor van Ingen collected fossil plants, explored an extensive and interesting forest, containing many climbing aroids and other vines, including a beautiful purple-flowered *Solanum* drooping from a tall tree and a Bignoniad with large yellow flowers. *Hernandia*, a tall tree with broad leaves, which bears bladdery fruits that rattle in the wind is abundant here, and one of the native species of *Annona*, which has large, warty fruits, was seen with interest.

Saline Bay, on the eastern coast, and the wonderful Mora Forest northeast of Sangre Grande were studied on April 10, with Mr. and Mrs. Nowell. In a mangrove swamp at Saline Bay we detected a colony of a *Crinum* with bulbs deeply sunken in the mud and connected by offsets up to a yard long, an unexpected addition to the Trinidad flora. The orchid vine *Vanilla inodora* droops from trees in the Mora Forest, forming fine festoons of broad, shining, green leaves, and we obtained good specimens in flower, and the small-leaved *Vanilla Hartii*, endemic in Trinidad, was also collected but not in bloom; this forest yielded many specimens of ferns, mosses and fungi.

A very interesting excursion was made on April 11 to swampy forest, ponds and wet meadows near the Caroni River south of Arima. The ponds were full of white and pink water-lilies (*Castalia*), their rather small flowers opening in the evening after they were picked, and with a curious fragrance like xylol. Several kinds of sedges are abundant on the marshes, among them *Scirpus cubensis*, a rare species in Trinidad, its flowers in corymbose heads. The most conspicuous trees in flower were *Spachea elegans* of the Malpighia Family, with drooping tassels of pink flowers, and *Pentaclethra filamentosa* of the Mimosaceae, with long spikes of flowers with bright white filaments; *Henrietella*, a small Melastomad tree was also in bloom, its small pinkish flowers borne on twigs below the leaves, and the woody pods of *Apalatoa*, a marsh tree of the Cassia Family, were obtained.

On April 12 we drove to the Pitch Lake near Brighton on the

western coast, making collections there and at points on the way. Flowers of the spiny palm, *Bactris major*, not seen by us before, were obtained near the mouth of the Godineau River and the hillsides nearby yielded specimens of some trees and shrubs. Our final excursion of the trip was made on April 14, to the famous Aripo Savanna, always a region of botanical interest, with its wide grassy plains enclosed by dense forests. Pink, white, purple and yellow Bladderworts were plentiful, a tall white-flowered ground orchid conspicuous and attractive, and a forest stream, said to be the home of large strangling snakes, which we did not see, is a watergarden of great beauty.

Through the kindness of Mr. Freeman, our Cactus investigation was aided by his obtaining for us fine specimens of the Turk's-cap or Melon Cactus of Tobago Island, which proves, as surmised by Dr. Rose from a study of incomplete material, to be a species new to science, apparently restricted in distribution to Tobago.

I was interested in an inquiry recently made relative to timbers of the northern South American region which might be available for railroad ties in the United States, and ascertained that the woods used for this purpose in Trinidad are those of Mora (*Dimorphandra excelsa*), Balata (*Mimusops Balata*) and White Poui (*Tabebuia serratifolia*). Of these, the last is said to be the most durable in the soil, but in Trinidad, at least, is the most difficult to obtain. These Poui trees were in full bloom during our visit, their profuse yellow flowers forming conspicuous, scattered masses of color on the northern mountain range, one of the most beautiful floral features of the island; the tree is of the family Bignoniaceae and a relative of our northern *Catalpa*.

The herbarium and museum specimens made during the trip aggregate over 1500 field numbers, including at least 6000 specimens, inasmuch as an average of about four specimens of each kind was taken; a complete set will now be incorporated in our permanent collections and the duplicates distributed to the other cooperating institutions and otherwise, as exchanges. I also obtained in exchange several hundred specimens from the herbarium of the Trinidad Botanical Garden, and purchased a considerable number from collections formerly made in Trinidad by Mr. W. E. Broadway. We have thus brought in important accessions to our representation of this interesting flora.

Under our arrangement with the Gray Herbarium and the United States National Museum, Mr. Broadway has been commissioned to proceed to French Guiana for botanical study and collecting over a period of three months; he left Trinidad for this errand on April 10, and we expect to receive the specimens obtained by him during the summer. Most of the collection made last year by Dr. A. S. Hitchcock in British Guiana has been studied; some specimens have been sent to Kew for study there and report to us by Mr. N. E. Brown and in order to increase our knowledge of British Guiana, I have detailed Dr. H. A. Gleason to proceed there this summer and make collections in regions not visited by Dr. Hitchcock.

Respectfully submitted,

N. L. BRITTON,
*Director-in-Chief.*

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## GUIDE TO THE ECONOMIC MUSEUM

On April 30th, Dr. H. H. Rusby's *Guide to the Economic Museum of the New York Botanical Garden*[1] was issued. As the work is a catalogue of extensive collections assembled to emphasize the importance of plant life to the human race, it is a contribution to the literature of economic botany that has permanent value and should prove distinctly useful apart from the special service it was prepared to perform.

The Introduction stresses one fact that every worker among economic plants comes to realize sooner or later, that is, the difficulty of positive botanical authentication of economic raw products. It is patent that the economic species and the systematic species are not always similar concepts. As a result, botanical identification of vegetable products is only possible when herbarium specimens are available that are known to represent the source plants. In order to do away with the loose methods that are an evil inseparable from museum work under ordinary circumstances, the curators of the New York Botanical Garden collection have made persistent efforts to tie up to botanical sources the specimens intended for preservation and exhibition. Indeed, Dr. Rusby is able to state that in the pursuit of this object and

[1] Bull. N. Y. Bot. Gard. **11**: 1-318. 30 Ap 1921.

in the extent to which it has been carried out, the collection of economic products in the New York Botanical Garden is probably unique.

In the Guide, the classification of materials is made in accordance with the nature of the products, and, in general, accentuates botanical affinities only when species are arranged in botanical sequence under special categories. This classification for general purposes seems to have many advantages over a strictly botanical sequence although it leads to a wide separation of the products of the same species.

The ideal arrangement of products in two series, one to exhibit exhaustively the economic value of a family, the other to exhibit the extent to which the vegetable kingdom yields products adapted to similar uses, has the disadvantage of duplication of material and makes inordinate demands on valuable space. The best treatment for public exhibitions is undoubtedly one that illustrates the different categories under which raw products enter the commercial field, and it is this treatment that characterizes the Guide to the economic collections of the New York Botanical Garden.

Combined with the descriptive text which accompanies each of the twenty-six main divisions, the list of species and products constitutes a useful survey of economic plants and indicates an enormous expenditure of painstaking endeavor by the author. When the work is studied with the knowledge that it represents authentication, identification and arrangement by Dr. Rusby of the 7,069 specimens listed, it is at once apparent that the Guide to the Economic Museum is to be regarded not merely as a compilation, but as a distinctly valuable contribution to the reference literature of economic botany.

OAKES AMES.

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## BIRDS IN THE BOTANICAL GARDEN

This spring not only seems to have been an unusually favorable one for the observation of bird-life in the Garden, but the number of observers engaged in this interesting outdoor recreation has doubtless been greater than ever before, which would at least partly account for the many species noted. The earliest arrivals

from the South were the red-wing blackbird and robin during the first week of March. Next came the bluebird, whose presence seems to announce, to many, more definitely than that of any other bird, the real beginning of another Spring. The bluebirds were followed shortly by the grackle and meadowlark. Then came the phoebe and goldenwinged woodpecker or flicker, soon followed by the cowbird and towhee, these March arrivals all being birds that remain in more or less numbers to nest in the Garden. Next observed were two migrants that pause only for a short time here before going on farther north to their summer homes, namely, the hermit thrush, on April 4th and ruby-crested kinglet, April 5th. These were followed by the chipping sparrow, a summer resident, and on April 7th a flock of palm warblers were seen, the earliest of the wood-warblers, soon to be followed by a somewhat straggling host of others, representing many species and including some of our most beautiful native birds. A number of these warblers are rarely seen and then only by persistent effort, for the majority of them breed farther north and may pause with us for only a short period, during which they will be found mostly among the upper branches of the forest trees. This year the warblers appeared in greater numbers than usual, from about the 13th to the 16th of May, a period including the time of the severe storm in which so many birds, warblers and many other species were found dead in or near Madison Square Park. (It was estimated that about 1,000 bodies of the smaller birds were scattered about, evidently killed by striking the head against glass or other parts of the tall buildings near.)

Returning again to Garden birds, of migrants that nest with us, the brown thrasher first appeared April 18th, the house wren April 24th, the cat-bird April 30th and shortly after the Wilson's thrush or veery and the wood thrush, all of these being fine songsters and frequently heard along our walks.

Another nesting bird, but a more or less permanent resident, the wood duck, appeared May 7th, surrounded by 14 lively youngsters, on a small pond not 300 yards from the Museum building. For a few days the family were unmolested, but suddenly all disappeared. They were gone from the locality for a week, then the mother bird appeared again, much shyer than before and accompanied by only five young. The rough hand of the world had evidently been hard on her, what with weasels,

snapping turtles and perhaps still worse, human enemies on every side.

And to pass from one of the largest to the very smallest bird that nests in the Garden, the humming-bird certainly lost no time in home building on arriving north, for one was found sitting on her tiny, lichen-covered, knob-like nest May 15th, and she seems to have safely survived the storms and cold thus far and will soon have young to feed if every thing goes well. Other birds that have prospered with their families, much too well to to please some, are the starlings. They were never so numerous before during the breeding season, occupying many cavities in the larger trees, and already the young are flying about, almost or quite able to care for themselves (May 22nd).

And speaking of cavities in trees, recalls an incident that happened a number of weeks ago. It seems a bluebird, recently arrived, was examining rather carefully a hollow limb, evidently with a view to nestbuilding. Two ubiquitous house sparrows shortly appeared on the scene and a fight promptly began for possession of the premises. The bluebird could drive off either sparrow when alone, but together the sparrows were too much for the bluebird, which, after fighting for half an hour or so, finally left the field to the sparrows, not, however before removing a feather or two from at least one of them. It would appear that the sparrows did not really care for the place, as they have failed to make any use of it, all of which seems to show that they are not wholly desirable citizens, with which remark these brief notes must be closed, although many of our very commonest birs have not been mentioned.

R. S. W.

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## CONFERENCE NOTES FOR APRIL.

The conference of the scientific staff and registered students of the Garden for April was held on the afternoon of April 6th.

Dr. W. A. Murrill discussed "Resupinate Polypores" and exhibited various specimens of this interesting and important group of fungi.

Dr. Murrill's publications on this group are to be found chiefly in Volume 9 of *North American Flora*, and in *Mycologia* for September, 1919; January, March, and November, 1920; and March

and May, 1921. He has described about 10 new genera and 80 new species, out of a total of about 140 species treated; has reduced many specific names to synonymy; and made many new combinations. There still remains considerable work to be done. The difficulties of the group were thus presented by Dr. Murrill:

"The resupinate polypores are particulary difficult for several reasons. In the first place, they lack the definite shape which is often a determining character in the pileate forms; they are, moreover, entirely destitute of a "surface," with the various important characters which it usually affords; and they are mostly small, the characters that are present being necessarily on a small scale.

"As a rule, each individual specimen has to be examined with the microscope, and, even then, the well-known variability in microscopic characters often leaves one in doubt. In working with original specimens in foreign herbaria, it is often impossible to get satisfactory results because of the character of the work required and the time it consumes. Accidental resupinate forms among pileate species also give considerable trouble because of their close resemblance to forms uniformly resupinate, and for this reason a wide and accurate knowledge of pileate forms is essential."

"The white and bright-colored resupinates are more difficult than the rest because there are more species with fewer characters, more confusion with pileate forms, and less chance of obtaining spore characters. Specimens found in the herbaria are almost invariably without notes, as well as without good spores, so that the preparation of adequate descriptions must be left to those having access to fresh specimens or to recently collected material."

"Herbarium specimens are also badly mixed and it is necessary in nearly all cases to get at the actual types for comparison. Histological studies and enlarged drawings from type material may be interesting and helpful but they can never take the place of the types themselves. What we need is an abundance of carefully collected and described fresh material closely compared with originals and distributed to all the principal taxonomic centers for the use of students for indentification."

A. B. STOUT.
*Secretary of the Conference.*

# NOTES, NEWS AND COMMENT

The John Burroughs Memorial Association was inaugurated on April 15 at a meeting of a number of his friends at the American Museum of Natural History, the immediate purpose of the association being to protect Mr. Burroughs' home and camps against vandalism and to preserve them, with their wild life, for future generations. The Committee appointed to complete the organization included Dr. Frank Chapman, Dr. G. Clyde Fisher, Mr. Carl E. Akeley, Mr. Hamlin Garland, Judge A. T. Clearwater, Mr. Kermit Roosevelt, Mrs. Thomas A. Edison, Mrs. Henry Ford, and Mr. W. O. Roy.

Fifty members of the Woman's Municipal League, including the president, Mrs. Frederick C. Hodgdon, and other officers, visited the Garden on the afternoon of April 27 and were guided through portions of the grounds and buildings. The day was exceptionally fine and the Japanese cherry trees and Darwin tulips made an excellent showing. Tea was served at the Mansion under the supervision of Mrs. M. G. Starrett, who planned the excursion.

Professor H. H. Whetzel of Cornell University and Dr. C. Ferdinandsen, professor in plant pathology at the Royal Agricultural College, Copenhagen, were among the recent visitors at the Garden. Professor Whetzel is planning to spend a year in Bermuda devoting his time to a survey of the fungi of the islands, especially those species causing plant diseases.

Dr. Van Evrie Kilpatrick visited the Garden on Saturday, May 21, with a number of teachers from various parts of the city and was shown exhibits of special interest in connection with nature-study work.

Dr. H. E. Thomas, assistant professor of plant pathology in Cornell University, recently spent a day at the Garden looking over our collections of parasitic fungi.

Dr. H. S. Jackson of Purdue University, Lafayette, Indiana, spent a few days at the Garden recently looking over specimens of plant rusts.

Dr. H. A. Gleason, Assistant Director, left the Garden early in June for British Guiana in order to make extensive botanical collections in that region.

Bulletin 41, prepared by Dr. H. H. Rusby, honorary curator of the economic collections, was issued April 30, 1921. It contains a descriptive catalog of specimens in the museum illustrating useful plants and plant products; 7,069 numbers being listed on 318 pages of text. Separates of this bulletin have been bound and placed on sale at $2.00 each. It is reviewed on a previous page by Mr. Oakes Ames.

*Meteorology for March:*— The total precipitation for the month was 2.22 inches. The maximum temperatures recorded for each week were as follows: 65° on the 6th, 71° on the 7th, 79° on the 20th, and *86° on the 21st.* The minimum temperatures were: 24° on the 5th, 29° on the 11th, *23° on the 19th*, and 30° on the 23rd. Ice disappeared from the middle lake in the night of the 7th.

*Meteorology for April:*— The total precipitation for the month was 3.21 inches. The maximum temperatures recorded for each week were as follows: *81° on the 5th*, 72° on the 13th, 78° on the 21st and 77° on the 25th. The minimum temperatures were: *29° on the 2nd*, 30° on the 11th and on the 12th, 37° on the 19th and 47° on the 27th.

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The contribution of $5000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a patron of the Garden.

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The contribution of $1000.00 or more to the funds of the Garden at any one time shall entitle the contributor to be a fellow for life of the Garden.

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Annual members pay an annual fee of $10.00.

All members are entitled to the following privileges:

1. Tickets to all lectures given under the auspices of the Board of Managers.
2. Invitations to all exhibitions given under the auspices of the Board of Managers.
3. A copy of all handbooks published by the Garden.
4. A copy of all annual reports and Bulletins.
5. A copy of the monthly Journal.
6. Privileges of the Board Room.

## 7. Life Members

Annual members may become Life Members by the payment of a fee of $250.00.

## Information

Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

## Form of Bequest

**I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....**

Vol. XXII June, 1921 No. 258

# JOURNAL

OF

# The New York Botanical Garden

EDITOR

R. S. WILLIAMS

*Administrative Assistant*

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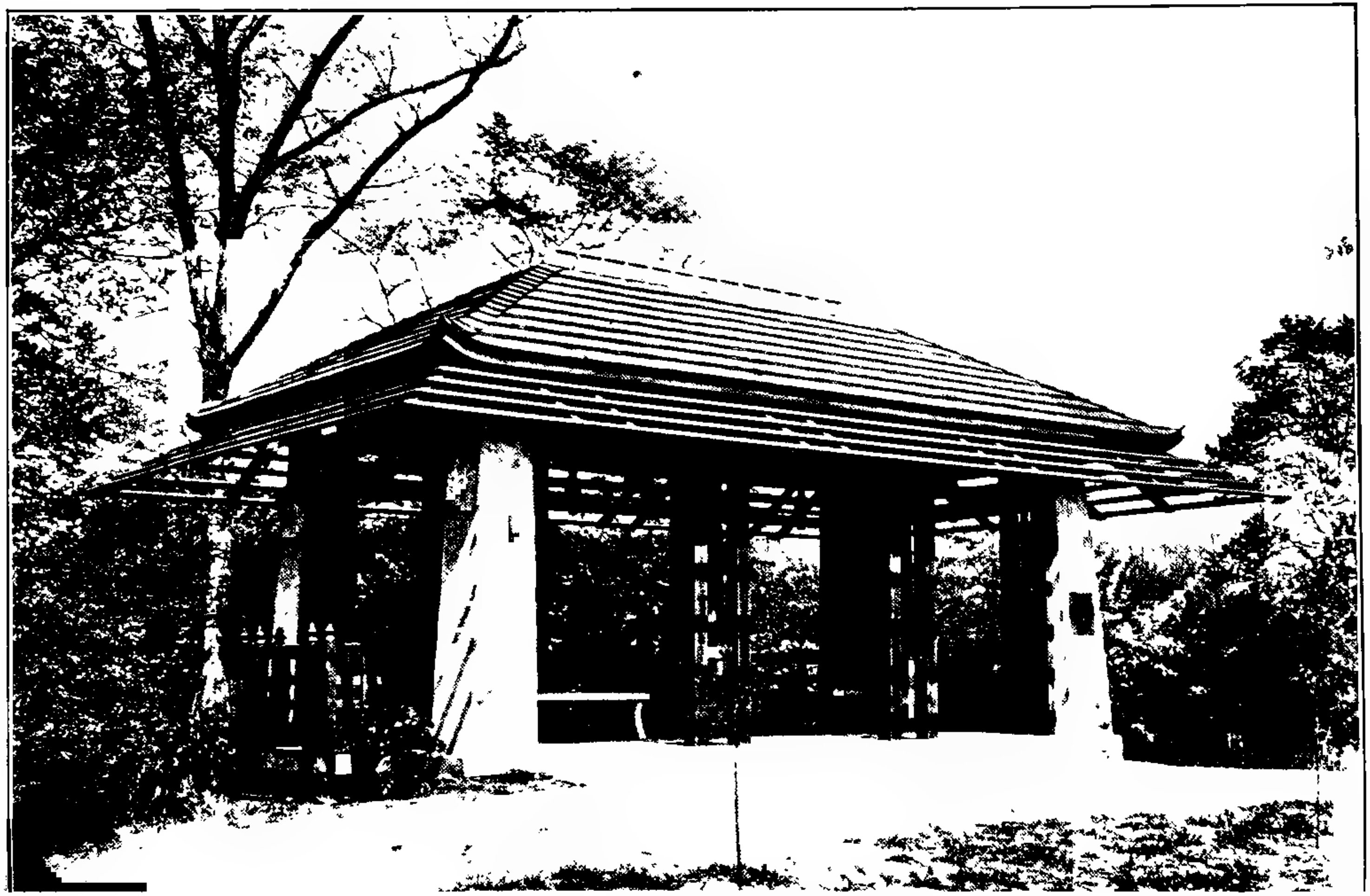

JOURNAL
OF
The New York Botanical Garden

VOL. XXII June, 1921 No. 258

# THE CHERRY GARDEN SHELTER

WITH PLATE 257

Among the various structures needed for the development of the Garden included in the plans of the Endowment Committee of the Board of Managers, the recently built Cherry Garden Shelter is one of the most useful and interesting.

Situated on the crest of a knoll lying between the Cherry Garden and the driveway, the Cherry Garden Shelter commands a view of wide and diverse interest. Overlooking the garden one can see the broad panaroma of lovely color when the cherry trees are in bloom, the soft tints of pink, blending through white to lavender, set off to advantage through the trellises and from the shade of the shelter. Looking away from the garden, the view takes one out over the Long Bridge to the Fruticetum and far beyond. To the south there is a long vista through the Magnolia Valley and to the north the view is closed by the fine group of beech trees along the River Road.

With a quaint touch of Old Japan the Cherry Garden Shelter has the quiet charm of age, the gray of its cast stone, the silvery weathering of its woodwork and the soft dull tone of its roof making a delightful foil to the gracefully drooping foliage of the trees along the slopes of the valley below. The choice of a style was suggested by the fact that the cherry trees forming the grove are largely natives of Japan and are peculiarly fine specimens. With characteristically upturned corners, the roof of the shelter is supported at the outside by four large gray cast stone piers, its eaves carrying a light trellis soon to be clothed with the exquisite tendrils, flowers and foliage of the wisteria. Beween the piers are intermediate supports of old oak, trellised also in

native fashion. With balconies on the ends and rear, the sh is surrounded on three sides by a light railing, the fourth open to the Cherry Garden. Cast stone seats provide res places for those seeking shelter.

The structure[1] bears a bronze tablet with the following scription:

Cherry Garden Shelter
built in 1920 by
Nathaniel Lord Britton
and
Elizabeth Gertrude Britton
in memory of
Charles Patrick Daly
and
Maria Lydig Daly
Benefactors of the
New York Botanical Garden

JOHN R. BRINLE

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## STEWARDSON BROWN

By the death of Mr. Stewardson Brown at his home in Germ town, Pennsylvania, on March 14th, 1921, botanical scie has lost one of its very useful members, and the New York tanical Garden one of its highly valued correspondents.

Mr. Brown was born in Germantown on April 29th, 1867 was a member of a distinguished family, descended from He Brown who came from England to Massachusetts in 1639. great-grandfather Thomas Stewardson was deeply interested plants and was one of the founders of the Horticultural Soci of Philadelphia and his more immediate ancestors were a lovers of plants and of flowers. His botanical studies began his boyhood, while in the Germantown Academy, from wh institution he was graduated in 1885; as early as 1882 he w

[1] The plans and specifications for the Cherry Garden Shelter, as well as supervision of its construction, were contributed, without charge, by Brinley, Landscape Engineer of the Garden, who was aided in his desig Mr. Louis F. Bird. It was built under the direction of Mr. Arthur J. Cort Superintendent of Buildings and Grounds, without having recourse to contractor. (EDITOR.)

member of a natural history club which investigated the flora, fauna and geology of Germantown; he early became a frequent visitor of the collections at the Academy of Natural Sciences of Philadelphia, thus coming under the stimulating influence of Mr. Thomas Meehan, Mr. John H. Redfield, Mr. W. M. Canby, Dr. J. Bernard Brinton, and Dr. Joseph Leidy. After a few business years in the employ of the Lehigh Valley Railroad, he became a volunteer assistant to Mr. Meehan in the herbarium of the Philadelphia Academy, and he was given charge of the botanical collections there about 1898, a position which he filled until his death, continuously increasing these collections by field work in Pennsylvania and New Jersey; he brought important accessions from the Keys of southern Florida in 1905; from Trinidad and Venezuela in 1911; from the Canadian Rocky Mountains in 1906; from Jamaica in 1910.

He was with me in Bermuda in 1905 and again in 1912 and 1913, and was there alone in 1908 and 1909; his cooperation in the study and collecting of the plants of Bermuda was most important in the preparation of my "Flora of Bermuda" published in 1918; Brown published a preliminary paper entitled "Notes on the Flora of the Bermudas" in the Proceedings of the Philadelphia Academy, **1909**: 486-494. He also accompanied me to Porto Rico in the early part of 1915, where we made large collections.[1]

I first made his acquaintance about 1891, either at the herbarium of the Philadelphia Academy or on one of the joint field meetings of the Torrey Botanical Club and the Philadelphia Botanical Club, and we became intimate friends, meeting each other frequently, either in New York, in Philadelphia, or in the field; his companionship was always delightful, and we discussed and compared specimens of many species of plants of the local floras of Philadelphia and New York; he was elected a member of the Torrey Botanical Club on May 14th, 1893.

Brown was an enthusiastic collector but not a voluminous author. He published in 1905, with Dr. Ida A. Keller, a very useful "Handbook of the Flora of Philadelphia and Vicinity," a work of 360 pages, and in 1907, his "Alpine Flora of the Canadian Rocky Moutains," 353 pages with many reproductions

[1] Journ. N. Y. Bo. Gard. **16**: 103-112.

of water-color drawings and of photographs by Mrs. Charles Schaeffer.

N. L. BRITTON

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## VISIT FROM HIGH SCHOOL PUPILS

200 biology pupils from the Washington Irving High School visited the Garden on the forenoon of Monday, June 13, to study tropical plants in the conservatories; herbaceous plants and trees on the grounds; plant products in the museum; and to hear a lecture on Forestry in the large lecture hall. They were in charge of Miss Mullen and several other teachers in biology. The lecture was given by Mr. Inman.

650 biology pupils from the Morris High School spent the forenoon of Tuesday, June 14, at the Garden in charge of Dr. Peabody and his staff. The program was similar to that of the day before, only the lecture by Mr. Inman was given first, followed by the observation work in the museum and on the grounds.

460 biology pupils from the Evander Childs High School in charge of Mr. Mann and several of his teachers spent the afternoon of Thursday, June 16, in carrying out their usual program at the Garden, beginning at the conservatories near the Elevated Station and taking up herbaceous plants and trees, prior to the museum work and lecture. Mr. Hastings occupied the platform and spoke to the pupils on the subject of Forestry.

Members of the Garden staff acted as guides and instructors during all of these exercises with the high school pupils. The weather was perfect and the grounds were at their best. A total of over 1,300 pupils were in attendance at the three series of lectures and demonstrations.

W. A. MURRILL

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## SPRING INSPECTION OF GROUNDS, BUILDINGS AND COLLECTIONS

The spring inspection was carried out successfully on the afternoon of Thursday, May 5, 1921, including a visit to Conservatory Range 1, where special attention was given to the col-

lections of palms, ferns and their relatives, aroids, bromeliads, and tropical water plants. The party then proceeded to the new Horticultural Gardens entrance on the Southern Boulevard, recently constructed through the expenditure of a bequest of Mrs. Mary J. Kingsland, where a tablet recording this gift was unveiled by Mrs. Theron G. Strong, Secretary of the Women's Auxiliary, and the great collection of tulips given by the General Bulb Growers Association was inspected, as well as the progress of construction and planting of the new Rock Garden, the new Fern Garden, and the new Iris Garden.

The party then proceeded by motor cars to Conservatory Range 2, to view the collections in the Central Display Greenhouse, and thence to the Cherry Garden Shelter. Tea was served in the Mansion by the members of the Women's Auxiliary present.

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## NOTES, NEWS AND COMMENT

A long-needed connection between parts of the path-system east and west of the River Road at the lower end of the Cherry Garden Valley, in a grove of beech trees, has recently been effected by building a flight of stone steps up from the river path to the driveway level. The steps were made of slabs of gneiss obtained in grading operations within the Garden and large rounded drift boulders from within the grounds form the walls. Considerable earth embankment, also obtained in grading, was required to make suitable slopes from the boulder walls; these have been planted with honeysuckle vines and the structure has been denominated Honeysuckle Steps. The work was made possible by a gift of money from Mr. Leon Schinasi, through Mr. Daniel Guggenheim, Chairman of the Endowment Committee of the Board of Managers.

An underground gasteromycete, apparently a species of *Hysterangium*, was brought to me about the middle of February by Mr. L. Robba, who collected it with a trained truffle dog under an oak tree near White Plains, New York. The soil was not frozen hard, because of the mild weather and a layer of two or three inches of leaves, but the tiny "puffballs" were frozen and made very poor specimens when dried. The spores were rather

rough, ovoid, and distinctly umber-brown under a microscope. Mr. Robba naturally thought they were truffles, but he did not notice any odor and he recalled that his dog was not particularly "interested" in the find, only scratching a little to mark the spot and then walking away. The plants were unearthed by scraping off the coverings of leaves and digging about two inches into the soil. There must have been *some* odor present, otherwise the dog would not have been attracted.

What we need here in the East is an army of enthusiasts like Mr. Parks, who would take long journeys with rake and hoe and explore for underground "puffballs." A few trained truffle dogs would also be invaluable. This is a matter for mycological and botanical clubs to consider. The autumn is the best season for such work. (W. A. M.)

The New York Bird and Tree Club met Saturday, May 28th, at the Garden, taking their luncheon at the Mansion. The special object of their visit was a study of trees, following a suggestion made by Dr. Murrill when he lectured to them on May 20th at the Swiss Chalet in Central Park. Among other interesting sights that of a humming bird on its nest brought a thrill to many who had never before enjoyed this rare privilege.

The Girl Scouts of the Bronx came to the Garden by troops every Saturday in May to become better acquainted with the common trees and flowers. Mr. Percy Wilson was in charge of these excursions, which were initiated on April 30, when Scouts from all parts of the Bronx participated in a walk through the grounds to see and hear about the natural features and the chief cultivated areas.

Dr. A. B. Stout spent two weeks during June at the State Experimental Station at Geneva, N. Y., in making further study of flower types in grapes and in the work of breeding for seedless sorts of hardy grapes. This work is being done in cooperation with the Department of Horticulture of the Experimental Station.

The following visiting botanists have registered in the library during the spring: Mr. Carlton D. Howe, Morrisville, Vt.; Mr L. E. Melchers, Manhattan, Kansas; Miss Elsie M. Wakefield, Royal Botanic Gardens, Kew, England; Mrs. Nellie F. Flynn, Burlington, Vt.; Prof. Arthur S. Graves, New Haven, Conn.;

Prof. F. E. Lloyd, McGill University; Prof. W. W. Rowlee and Dr. H. E. Thomas, Ithaca, N. Y.; Hermano Idinael-Henri, Bogota, Colombia; Prof. K. Ryu, College of Agriculture, Morioka, Japan; Prof. H. S. Jackson, Lafayette, Ind.; Miss Stella G. Streeter, Jersey City, N. J.; Prof. W. A. Setchell, Berkeley, Calif.; Mr. W. W. Eggleston, Washington, D. C.; Mons. Louise Sander, Bruges, Belgium; Prof. John W. Harshberger, Philadelphia, Pa.; Dr. C. F. Millspaugh, Chicago, Ill.; Mr. C. Ferdinandsen, Copenhagen, Denmark; Prof. G. W. Martin, New Brunswick, N. J.; Mr. L. W. Brownell, Paterson, N. J.; Professors W L. Bray and Henry F. A. Meier, Syracuse University.

*Meteorology for May*: The total precipitation for the month was 2.62 inches. The maximum temperatures recorded for each week were as follows: 73½° on the 8th, 81° on the 9th, *92° on the 22nd* and 84½° on the 29th. The minimum temperatures were 43° on the 6th and on the 12th, 42° on the 17th and *41° on the 24th*.

---

## ACCESSIONS

### LIBRARY, FROM FEBRUARY 1 TO APRIL 30, 1921

*Acta forestalia fennica.* Vols. 1–12 Helsingforsiae, 1913–20. (Given by the Forstwissenschaftliche Gesellschaft in Finnland.)

AMES, OAKES. *Orchidaceae;* Fascicle VI. Boston, 1920. (Given by the author.)

CASARES GIL, ANTONIO. *Flora ibérica. Briofitas 1. Hépaticas.* Madrid, 1919.

*Commissão de linhas telegraphicas estrategicas de Matto-Grosso ao Amazonas. Publicação* 26, 38, 40, 41, 43, 45, 51. Rio de Janeiro, 1914–19. (Given by the American Museum of Natural History.)

CZAPEK, FRIEDRICH. *Biochemie der Pflanzen.* Ed. 2, Vol. 3. Jena, 1921.

DELILE, ALIRE RAFFENEAU. [*Mémoires botaniques extraits de la "Description de l'Egypte."*] Paris, 1813.

DE WILDEMAN, ÉMILE AUGUSTE JOSEPH. *Mission Émile Laurent.* Fasc. 1–5 (1903–1904) Bruxelles, 1905–07.

*Kew. Royal Botanic Gardens. Catalogue of the library. (Supplement) Additions received or incorporated in the years* 1898–1915. London, 1919. (Given by the Director of the Royal Gardens, Kew.)

MAYER, JOHANN. *Pomona franconia.* 3 vols. Nürnberg, 1776–79.

MATSUMURA, JINZO. *Icones plantarum koisikavenses.* Vols. 1–3. Tokio, 1911–19.

MIYABE, KINGO, & KUDO, YUSHUN. *Icones of the essential forest trees of Hokkaido.* Fasc. 1–3. Sapporo, 1920–21. (Given by Shinichi Kasai.)

*Park international.* Vols. 1, 2. Washington, 1920–21.

*Quarterly journal of forestry.* Vols. 12–14. London, 1918–20. (By exchange with the Royal English Arboricultural Society.)

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RUSBY, HENRY HURD. *Descriptions of three hundred new species of South American plants.* New York, 1920.

SARGENT, CHARLES SPRAGUE, ed. *Plantae Wilsonianae.* Vols. 1–3. Cambridge, 1911–17.

SHAW, GEORGE RUSSELL. *The genus Pinus.* Cambridge, 1914.

SMITH, GILBERT MORGAN. *Phytoplankton of the inland lakes of Wisconsin.* Part 1. Madison, 1920. (Given by Dr. N. L. Britton.)

TUCKER, ETHELYN MARIA, comp. *Catalogue of the library of the Arnold Arboretum.* 2 vols. Cambridge, 1914–17.

*University of California. Graduate school of tropical agriculture and Citrus experiment station. Publications* Vols. 1–3. Riverside, 1913–21. (Given by the Citrus Experiment Station.)

WIESNER, JULIUS VON. *Die Rohstoffe des Pflanzenreiches.* Ed. 3, Vol. 2. Edited by T. F. Hanausek & J. Moeller. Leipzig, 1918.

WILSON, ERNEST HENRY, & REHDER, ALFRED. *A monograph of azaleas.* Cambridge, 1921.

WÜNSCHE, FRIEDRICH OTTO. *Die Kryptogamen Deutschlands. Die hºheren Kryptogamen.* Leipzig, 1875. (Given by Dr. S. M. Stocker.)

## MUSEUM AND HERBARIUM

1 specimen of *Dothichloe* sp. from Virginia. (By exchange with the Bureau of Plant Industry.)

1 specimen of *Dothichloe strangulans* from British Guiana. (By exchange with the Bureau of Plant Industry.)

1 specimen of *Naucoria* from New York City. (Collected by Dr. F. J. Seaver.)

2 photographs of *Macropodia semitosta.* (By exchange with Mr. Burtt Leeper.)

3 specimens of *Hapalopilus gilvus* from the Hawaiian Islands. (By exchange with Mr. W. R. Maxon.)

1 specimen of polypore from the Bahamas. (By exchange with Mr. L. J. K. Brace.)

40 specimens of fungi from Porto Rico. (Collected by Prof. F. L. Stevens.)

2 specimens of *Gymnopus dryophilus* from Alaska. (By exchange with Mr. Paul C. Standley.)

2 specimens of *Boletus* from Massachusetts. (By exchange with Dr. E. T. Harper.)

9 specimens of fleshy fungi from Porto Rico. (By exchange with Prof. F. S. Earle.)

4 specimens of fungi from New Brunswick, New Jersey. (By exchange with Mr. G. W. Martin.)

1 specimen of *Monadelphus illudens* from Texas. (By exchange with Dr. J. J. Taubenhaus.)

13 specimens of plant rusts from the West Indies. (Taken from flowering plant collection by Dr. F. J. Seaver.)

1 specimen of *Phyllachora sphaerosperma* from the Bahamas. (Taken from flowering plant collection by Dr. F. J. Seaver.)

1 specimen of *Funalia stuppea* from Utah. (By exchange with Prof. A. O. Garrett.)

3 specimens of fungi from North Carolina and South Carolina. (By exchange with Dr. W. C. Coker.)

3 specmens of fungi from the southeastern United States. (By exchange with the Bureau of Plant Industry, Washington, D. C.)

3 specimens of fungi from Colorado. (By exchange with Prof. Ellsworth Bethel.)

1 specimen of *Geaster hygrometricus* from the New York Botanical Garden. (Collected by Mr. R. S. Williams.)

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EDITOR

R. S. WILLIAMS

*Administrative Assistant*

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*Zamia integrifolia* in pine woods on the Everglade Keys. Plant with ovulate (large) cones about the middle, one with staminate (smaller) cone near the right side of plate. Many acres of the rocky pineland were formerly as abundantly clothed with this cycad as is shown in plate. Large areas are as yet copiously populated with this esculent; still, in many places the orginal abundant growth has been much reduced by reckless harvesting, and in others, exterminated by the clearing of the land. The leaves are gathered, prepared, and used in floral decorations.

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# SEMINOLE BREAD — THE CONTI

## A HISTORY OF THE GENUS ZAMIA IN FLORIDA

WITH PLATES 258 AND 259

In the annals of Florida there is one wild esculent plant mentioned oftener than all the rest. This is the Conti of the Seminoles, the "Florida arrow-root" of the white man. Conti, in the Muskogee, of which the present-day Seminole speech of Florida is a varient, signifles "flour-root." Sometimes the adjective hateka or hatkee (white) is added to differentiate it from other starch-producing plants; but Conti is applied only to members of the genus *Zamia*.

Like many aboriginal or Indian names, the one in question appears in a variety of forms: Conti, Coontie, Coontia, Compte, Comtie, Koonti or Koontee. There are others. But in some such form the word dots the chronicles of Florida as references to "corn" run through the history of the world at large. And now this beautiful cycad that furnished a staple supply of starch to Florida's aborigines, then to her Seminoles, and later to the white population, is in danger of extermination.

There are a number of destructive agencies at work. The manufacture of "Florida arrowroot," the conversion of aboriginal shell-middens into material for new roads, the levelling of sand-dunes for building-lots, the clearing of land generally—these are but a few of them, that, if continued as at present, will soon relegate the once wide-spread zamia to a dwindling career in conservatories and gardens.

In this connection it is recorded that "from the tubers of this plant the Florida arrow-root is made. It is abundant in the

southern part of the State. The tubers are large, frequently a foot long and three inches in diameter, rough and dark on the outside, but white inside and yield a large percentage of starch. It possesses an acid, poisonous ingredient which has to be washed out in the process of converting the root into starch. The Indians of the Everglades consume a great deal of starch as food, prepared by their rude processes, and also sell some, but it is inferior to that prepared by Americans with improved machinery."[1]

"In Florida this Cycad [*Zamia intergrifolia*] is largely cultivated for the sake of the starch contained in its roots, large quantities of the starch being made for the Key West and West Indian markets. There are several establishments now engaged in this industry upon the shores of Bay Bicayne and upon Miami River just below where it flows out from the Florida Everglades." . . [2]

"On the low grounds of Southern Florida grows a beautiful plant of the Cycadaceae, *Zamia integrifolia* Willd., the 'Coontie' of the Indians, which contains in the caudex and roots about 65 per cent of an excellent starch sometimes called Florida arrow-root. This plant supplied the Seminoles with food during their long wars with the United States and is now more or less cultivated."[3]

How early the cycads of Florida were referred to in the writings and records of the pioneer travelers we do not know, but the technical botanical history begins with the printing of the formal description of one of the species in 1789.

The exact origin, and the circumstances connected with the independent discoveries, of a rather odd, but common, plant of Florida seemed, until recently destined to remain mysteries, although its history begins but little over a century ago. Even the original collectors are not mentioned in connection with the type specimens or with the original descriptions of the species and until quite recently there seemed to be no record extant from which we might learn their identity.

For the past score of years two well-marked species of the genus *Zamia* have been known from Florida.

It is recorded that "reseaches have shown that there are at least two species of Zamia in Florida, where only one has heretofore been recognized as occurring. These are *Zamia floridana* DC. and *Z. pumila* L. It was found that neither of the forms

[1] Edward Palmer, American Naturalist **12**: 600. 1878.
[2] Charles Sprague Sargent, Gardener's Chronicle. N. S. **26**: 146. 1886.
[3] Valery Havard, Bulletin of the Torrey Botanical Club **22**: 107. 1895.

studied could be referred to *Z. integrifolia* Ait. as has been done heretofore, this being a very distinct West Indian species."[1]

A note inspired by the paper in which the foregoing quotation occurs, follows: "The Cycads of Florida have recently been found . . . to include with certainty two species, *Zamia floridana* D C. and *Z. pumila* L. It is hence not known that Z. *angustifolia* Jacquemont and *Z. integrifolia* Aiton, are represented in Florida at all, or if indeed these latter are two distinct species. Nothing short of the comparison of plants from many localities, both insular and from the mainland well to the south, will settle this point, and also determine whether any other species than *Z. floridana* and *pumila* are indigenous to Florida."[2]

The wilderness of Florida served as the type locality for two species of *Zamia—Z. integrifolia* (1789) and *Z. floridana* (1868). The locality given for one species when first published was "East Florida," for that of the other merely "Florida."

Geography and imagination have played important and interesting parts in working out the facts and the history of *Zamia* in Florida. The lack of information above referred to and the localities "Florida" and "East Florida" were the inciting factors that led to the solution of the problems.

In the first place, Florida represents extensive territory, and as far as we know, no specimens of *Zamia* have been found growing wild in what has commonly been known as East Florida, for more than a century, unless the ones upon which the two species referred to above were founded. It is possible that the original specimens of the two species were secured from native plants in East Florida or from plants that were cultivated for their starchy stems by the Indians, all the supply of which might have been exterminated by extreme cold weather that is said to have ravished Florida in the thirties of the last century.

In the second place, "East Florida" might have been extended somewhat southward in the records of a collector to include the northern geographic limit of the genus *Zamia*, as we know it today, or it might have been used in the sense of peninsular Florida or of merely the eastern coast of Florida. In this latter case a coast line of some five hundred and fifty miles would have to be

[1] Herbert John Webber, Bulletin of the U. S. Department of Agriculture **1**: 81. 1901.

[2] George Reber Wieland, American Journal of Science. Ser. IV. **13**: 332. 1902.

considered. Thus, a very simple geographic statement may stimulate the imagination.

Although the finding of a record of where and by whom the type specimens of *Zamia integrifolia* and *Z. floridana* were collected seemed hopeless, we fortunately had access to the type-specimens themselves, though indirectly. We recently received tracings of both the specimens and the notes preserved on the original herbarium sheets. One of these, *Zamia integrifolia*, is at the British Museum in London; the other, *Z. floridana*, is in the De Candolle herbarium at Geneva.

Curiously enough, the tracings of the two specimens indicate the same species — not however, that of the more northern and early accessible eastern coastal region, but that of the interior and extreme southerly and later accessible eastern coast.

About the beginning of this century the two more common species of Florida were clearly distinguished, as already mentioned on a preceding page, both as to the specific characters and to the geographic ranges.[1] The one of more northern distribution was assigned to hammocks of middle peninsular Florida, particularly on the eastern coast; the other was assigned to flat-woods—pine-woods—east coast of Florida, below New River, Broward County.

It is of particular interest that the two perfectly distinct habitats for *Zamia* were recorded by Bartram and Baldwin respectively, about the beginning of the nineteenth century. The two species, however, were referred to under the botanical name *Zamia pumila*—a species inhabiting Hispaniola, and perhaps also some of the other West Indies.

William Bartram[2], writing of experiences and objects in the

[1] Herbert John Webber, Bulletin of the U. S. Department of Agriculture **1**: 81. 1901.

[2] William Bartram was born 9 February 1739, at the botanic garden of his father, John Bartram, at Kingsessing, near (now in) Philadelphia. He had the advantage of a better education than his father, and was an artist of considerable ability. He was a clerk in Philadelphia for a few years, and then a merchant in Carolina, but he was more interested in botany than business. In 1765 he joined his father in exploration in Florida, and when his father returned home in 1766 he remained as a settler on the St. John's; but the next year he returned to Kingsessing. From 1773 to 1778 he was engaged in botanical travels in the Carolinas, Georgia, and Florida, of which

Lake George region of Florida, records[1]: "The *Zamia pumila*, the *Erythryna corallodendrum*, and the *Cactus opuntia* grow here in great abundance and perfection. The first grows in open *pine forests*, in tults or clumps, a large conical strobile disclosing its large coral red fruit which appears singularly beautiful amidst the deep green fern-like pinnated leaves." The italics in the case of "*pine forests*" are ours. Likewise in the case of "*hammock*" in the following quotation.

William Baldwin[2] writing of experiences and objects along the lagoons south of the mouth of the Saint Johns River, records:[3] "Next morning, crossing the Inlet at the southern point of Penon Island, we ascended upper Matanza river,—which running south 10 or 12 miles close to the shore, originates by several heads in the swamps, a little westerly. Tracing the eastern branch, we landed early in the afternoon at the plantation of a Mr. Hernandez. Here, in a thin sandy *hammock* of small Live Oaks, Cabbage and Saw Palmettoes, I had the gratification to find the "Wild Sago," or Coontia, of the Seminoles,—and to assign it its place in the sexual system; Dioecia, Polyandria: natural order, Palmae. I have no books with me to refer to; but it is probably a new genus,—approaching very closely in habit to

an account was published in book form in 1791. The rest of his life was spent in scientific study at the garden at Kingsessing, in the homes of the owners of the garden—at first his brother John, later Colonel Carr—and it was there that he died, 22 July 1823.—John Hendley Barnhart.

[1] Travels through North and South Carolina, Georgia, East and West Florida 160. 1792.

[2] William Baldwin was born in Newlin township, Chester County, Pennsylvania, 29 March 1779. After practicing medicine for several years, and taking a partial course in this subject at the University of Pennsylvania, he shipped as surgeon in a merchant vessel sailing from Philadelphia in 1805, by way of Antwerp, for China. Returning the following year, he completed his medical course, receiving his doctor's degree in 1807. He practiced for four years at Wilmington, Delaware, removing to Georgia in 1811. In the following year he became surgeon in the United States Navy, and was stationed at St. Mary's for two years and a half, and for two years at Savannah. From March to May 1817, he visited Florida, devoting most of his time to botanical exploration. Later in the same year, as a naval surgeon, he accompanied a United States mission to Buenos Aires and other South American ports. Upon his return the following year he lived at Wilmington, Delaware, until he was appointed surgeon and botanist to Long's expedition up the Missouri. His health, always delicate, broke down soon after the expedition was under way, and he died at Franklin, Missouri, 1 September 1819. Many of his letters were published in 1843, by his friend Darlington, under the title "Reliquiae Baldwinianae."— J. H. B.

[3] Reliquiae Baldwinianae 225, 226. 1843.

the real Sago family (Cycas). At supper, I had the pleasure to eat the bread prepared from the large tuberous root of this plant. In the late times of difficulty many negroes, and others, were prevented from perishing with hunger by having recourse to it; and the slaves on this plantation now save half their allowance, in consequence of using it. I have no hesitation in saying that it will be found among the most important of our Esculentia. I believe I have already given you a hint of this plant. At some future period, I will give you more particular information." "Bowlegs, the grandson of Bartram's 'Long Warrior,' says, that 'Coontia' signifies Bread plant." (This proved to be the *Zamia pumila*. See subsequent letter, of May 27.) The above letter was written on May 15, 1817, from Tomoko, which is the old name for the site of the modern Daytona.

Later, on May 27, 1817, in writing from Saint Marys, Baldwin records: "I now find that my Coontia, or "Wild Sago," is nothing more or less than *Zamia pumila*."

While perusing some of the letters in the volumes of selected correspondence of Linnaeus and other naturalists, after the foregoing matter was written, we stumbled on the following paragraphs written by Alexander Garden[1] from Charleston, South arolina, to Linnaeus in Sweden, and to John Ellis[2] in London,

[1] Alexander Garden was born 20 January 1730, at or near Edinburgh, Scotland. Educated at Aberdeen and at Edinburgh, where he took his medical degree, he settled in South Carolina in 1752, and soon afterward made his home at Charleston, where he practiced medicine and studied the flora and fauna of the colony for nearly thirty years. During a northern journey in 1754 he became personally acquainted with Bartram and Colden and in the following year opened correspondence with Linnaeus. He was also for years a correspondent of Ellis, Collinson, Gronovius, and other botanists. Ellis named in his honor the genus Gardenia, known to all lovers of flowers. When the Revolution broke out, his only son joined the American troops, and was never forgiven, for the father was an ardent loyalist. In 1783, with his wife and daughters, he left South Carolina, and spent his remaining years in London, where he died 15 April 1791.— J. H. B.

[2] John Ellis was born in Ireland, probably in Dublin, about 1710. He became a merchant in London, and amassed a considerable fortune. In 1751 he became interested in the study of marine algae and other forms of aquatic life, especially what were then called "corallines," which he soon realized were some of them animals and others plants. Later he studied fungi and flowering plants. He was appointed King's agent for West Florida in 1764, and for Dominica in 1770, and imported to England many scientific specimens of various sorts, especially seeds of useful plants Among his correspondents were Linnaeus, and Dr. Alexander Garden of Charleston, South Carolina. He died at London, 15 October 1776.—J. H. B.

England: "The doctor [Andrew Turnbull] carries home some packages of East Florida plants, which you will see. I shall be very glad to know what you make of John Bartram's[1] Tallow tree, and what you call that herb whose leaves look like the Fern Osmund Royal, while its seeds are large red berries in a cone, somewhat resembling the Magnolia in appearance. I shall be glad to know what you call these two."[2] (Written February 2, 1767.)

The specimens are said to have reached Princess of Wales Garden at Kew, England, in 1768. There they came to the notice of William Aiton.[3] The interest once aroused continued for several years, as will be seen by the following quotations.

A few years later Alexander Garden writing to Linnaeus, said:

"In the same parcel with the fishes, I have sent, for your examination, a Florida plant, unknown to me, which should seem to belong to Gynandria. Its appearance is handsome enough, especially in autumn, when the woods are much ornamented with its beautiful fruit and seeds. This specimen shows the flowers in a head, as they at first appear; but they are soon succeeded by a cone-like pericarp, nearly of the same figure as that of a *Magnolia*. At length the capsules burst into two parts, displaying the large shapeless seeds, which turn red as they ripen,

[1] John Bartram was born 23 March 1699, at Marple, near Darby, Pennsylvania. He had been a farmer for several years before he became interested in botany, and was then for the most part, and of necessity, as he knew no one else interested in the science, self-taught. He traveled widely, from New York to Florida, and corresponded with various eminent naturalists abroad, especially with Collinson of London, who was, like himself, a member of the Society of Friends. About 1729 Bartram established at Kingsessing, then a surburb but now a part of the city of Philadelphia, the first botanic garden in America. For nearly fifty years an almost continuous stream of American seeds and plants, sent by Bartram, poured into the gardens of Europe. In 1765 he was appointed King's Botanist, and the modest salary accompanying this appointment enabled him, in spite of advancing age, to extend his scientific travels. In that year, and the next, accompanied by his son, he explored the St. John's River, Florida, and several of its tributaries. He died at Kingsessing, 22 September 1777.—J. H. B.

[2] Correspondence of Linnaeus and Other Naturalists 1: 552. 1821.

[3] William Aiton was born in 1731, at Hamilton, Lanarkshire, Scotland. As a young man he went to London, and was employed by Philip Miller at the Chelsea Physic Garden. In 1759 he was engaged by Augusta, Princess of Wales, to establish at Kew, her residence, a "physic" or botanic garden, and it is from this event that the present Royal Gardens, as a scientific institution, date. In 1789, he published his "Hortus kewensis," ard remained superintendent at Kew until his death 2 February 1793.—J. H. B.

and attract notice from a considerable distance. The height of the plant is 18 inches, rarely more. I am extremely desirous of knowing what it is, but dare not dissect this only specimen that has been brought me, which will be better in your hands. Formerly I have been in the way of seeing plenty of both fruit and seeds."[1] (Written June 20, 1771.)

Several years later Alexander Garden in writing to John Ellis again referred to the Bartram plant as follows: "I have taken the liberty of enclosing a letter for Linnaeus under this cover, and I beg you will forward it to him as soon as possible. It relates chiefly to an East Florida plant, of which I formerly sent you a fruit with the seeds therein. I have now carefully examined it, and you will see the characters, which are somewhat like the characters of the Zamia, but yet I think different. I have sent specimens of this plant, and of all parts of it, in a bundle directed to you, and given to Capt. William White's particular care. You will greatly oblige me if you will desire him to send these things to your house, and then forward them to Linnaeus."[2] (Written May 15, 1773.)

Then, in a letter to Linnaeus, referred to in the preceding quotation, Alexander Garden wrote:

"I am always glad to be employed in your service, of which I trust you are by this time well assured. That I might give a proof of this, on the receipt of your letter dated Upsal, the 16th of January, 1772, I took measures to procure from East Florida, where it grows wild, some specimens of your *Zamia*. I wrote to the Governor of that province, a great promoter of Natural History, and my particular friend, requesting him to send me some, carefully gathered, and well preserved, by the first opportunity. According to his usual kindness, he sent me what I wanted, as soon as the season of the year would permit, and from these specimens I have made out the following particulars and characters.

"You mention in your letter, that the pollen of this plant is naked, on the under surface of each scale of the cone (or catkin). But the most careful examinations, under a microscope, have satisfied me that this is by no means the case. I was much afraid of committing a mistake, and leading others into error, and therefore submitted several scales to repeated investigation, always with the same success, for I saw no difference between them. The pollen is evidently contained in bivalve, elastic capsules (anthers). It can scarcely therefore be referred, as you judge, to the Fern tribe, nor dare I assert it to be a *Zamia*. The construction of the female *spadix*, and of the pericarp, is very

[1] Correspondence of Linnaeus and Other Naturalists 1: 336-337. 1821.
[2] Correspondence of Linnaeus and Other Naturalists 1: 598-599. 1821.

Underground stems of *Zamia integrifolia* from the sand-filled cavities in the honeycombed floor of the pinelands. The slab in plate is over one foot wide. The stem of zamia is usually described as simple. In this species, at least, branched stems are not rare. Great irregularity in form and branching obtains. They produce a large percentage of a beautiful white starch which is freed from the wood and other impurities by maceration and washing. The spent material, shown in a pile behind the

singular. The peltate heads of the proper perianths are externally so closely united, that they can hardly be pulled asunder without tearing. It is therefore scarcely to be understood how the pollen of the anthers can insinuate itself so as to fertilize the germens. For the perianths never begin to separate before the germens become swelled, exhibiting manifest signs of impregnation being already accomplished. The vacant internal space indeed, between the partial stalks of the perianths, affords the germens and styles full liberty to grow; but the very close union of the shields prevents any access of external bodies, or even of the most subtile vapour.

"Being anxious to know more of this plant and its history, I have put the following questions to my friend the governor, by letter. Is there any *Spatha* or not? Are the male and female catkins always on the same plant, or from separate roots, and is there no variation in this respect? I have some suspicion that fecundation may take place sometimes in one way, sometimes in another. Do any birds, and of what kinds, feed on the seeds? Does the plant afford nourishment to any other animals? I am in daily expectation of an answer.

"It remains with you to determine the genus of this plant, and that you may not want materials to form your judgment upon, I now send you dried specimens of the male and female catkins, as well as of the seed-vessel or cone, containing ripe seeds."[1]
(Written May 15, 1773.)

A detailed description of the staminate and ovulate cones is appended to the letter, under the heading of "Characters of the dwarf palm from East Florida." Our Zamia was evidently quite a puzzle to the early botanists, for, we find them at one time or another, referring to the plant as, a *fern*, a *cycad*, a *palm!*

The political conditions and the approaching American Revolution were fatal to Alexander Garden's plans and correspondence, and nothing further appears with reference to *Zamia*.

Twenty-one years passed after the introduction of the John Bartram plant into Kew before the gardener there described and published it under the name *Zamia integrifolia*. Thus we have documentary evidence as to the collector of that species, and its origin was doubtless in the watershed of the lower St. Johns River, perhaps in the Lake George region, where William Bartram also found it as stated in a foregoing quotation.

Now, to pass to the second described Florida zamia. The discovery of documentary evidence concerning the origin and dis-

[1] Correspondence of Linnaeus and Other Naturalists **1**: 338-340. 1821.

coverer of *Zamia floridana* seemed even more hopeless than it did in the case of *Z. integrifolia*. However, we were not wanting for circumstantial evidence. In publishing *Zamia floridana*, Alphonse de Candolle[1] merely says, "E Florida sub nom. evidenter erroneo Z. integrifolia a cl. A. Gray, a. 1839." Now as A. Gray[2] had sailed for Europe in the fall of 1838, he had, evidently, taken specimens of this zamia with him and given them to Augustin de Candolle.[3] However, their source was still a

[1] Alphonse Louis Pierre Pyramus de Candolle, son of Augustin Pyramus de Candolle, was born at Paris, France, 27 October 1806; the family removed to Montpellier two years later. In 1814, however, he was sent to school at Geneva, Switzerland, and his parents later made their home at the same place. He studied law, receiving his degree in 1829, but he had previously done much work in botany, and thereafter devoted himself entirely to that science. He continued and completed the "Prodromus" begun by his father, and was the author of many important monographs, and of books on geographic botany, on the history of sciences, and on the origin of cultivated plants. He died at Geneva, 4 April 1893, after more than sixty years of scientific activity.—J. H. B.

[2] Asa Gray was born 18 November 1810, at Sauquoit, in Paris township, Oneida County, N. Y. While a student of medicine at the medical college at Fairfield, Herkimer County, he became interested in botany, and although he took his degree in 1831, he never practiced medicine. During the next few years he taught and lectured on mineralogy and botany at Albany, Clinton, Fairfield, and Utica, and in New York City, where he first went as an assistant to Torrey, and later became associated with him in the publication of their "Flora of North America." In 1842, he became a professor at Harvard, and it was here that he accomplished, during his forty-six years of service, the vast amount of careful work that secured him undisputed recognition as the foremost American botanist. He died at Cambridge, Massachusetts, 30 January 1888.—J. H. B.

[3] Augustin Pyramus de Candolle was born 4 February 1778, in Geneva, Switzerland. He was educated in his native city, and began the study of law there, but before he was twenty years old he went to Paris to pursue natural history studies. Coming under the influence of Lamarck, Desfontaines and other botanists, he decided to devote himself exclusively to the study of plants. After about ten years of study in Paris, during which he began the copious contributions to botanical literature which soon made him famous, he became in 1807 professor at the university of Montpellier and soon afterward director of the botanic garden there. In 1816 he returned to Geneva as professor in the university, and there rem ined until his death, 9 September 1841. He is best known to botanists, perhaps, by the "Prodromus" started by him in 1824, and completed by his son in 1873, but this great work was largely a compilation, while de Candolle published many important monographs and several monumental volumes devoted to the results of his original investigations.— J. H. B.

mystery. Now, in the acknowledgments of assistance in the preface to Torrey and Gray's "Flora" we find recorded: "From Middle Florida . . ; while from Southern and Eastern Florida we have received interesting collections from Dr. Leavenworth,[1] Dr. Burrows, Dr. Hulse, and Lieut. Alden[2] of the United States Army." All things considered, these facts and circumstances seemed to focus on one or more of the four army officers just mentioned as the possible collectors of the plant in question.

A scanning of the unpublished letters from these men to John Torrey[3] brought out the following, which is contained in some

[1] Melines Conklin Leavenworth was born 15 January 1796, at Waterbury, Connecticut. He studied medicine at Yale, receiving his degree in 1817, and practicing his profession at Catawba and Augusta, Georgia. From 1833 to 1840 he was a surgeon in the United States Army; stationed at first at Fort Towson, "Arkansas" (eastern Oklahoma); then at Fort Jesup, in western central Louisiana, doing some collecting in eastern Texas; from May to November, 1838, at Fort Micanopy, in north central peninsular Florida; then for a few weeks thirty miles east of Tallahassee; and during the first half of 1839, at Fort Frank Brooke, four miles from the mouth of the Steinhatchee River. During the remainder of his service he was stationed at Fort Gratiot, Michigan, but he resigned from the army in 1840, and retired to his old home at Waterbury, Connecticut. In 1862, although 66 years old, he enlisted as surgeon in the 12th regiment of Connecticut militia, and served with them in Louisiana until death claimed him. During all his travels he devoted his spare time to the collection of plants, which he sent to Short, Torrey, and others. He died near New Orleans, Louisiana, 16 November 1862.—J. H. B.

[2] Bradford Ripley Alden was born 6 May 1811, at Meadville, Pennsylvania. He graduated at West Point in 1831, and served in Florida as a lieutenant in the 4th Infantry, 1832-33, at first at Fort Brooke (Tampa), but most of the time at Fort King (Ocala); it was here that he made a considerable collection of plants for his friend Dr. Torrey. He was afterward instructor at West Point for seven years (1833-40) and commandant there for seven more (1845-52); wounded in service, he resigned from the army in 1853. He never fully recovered his health during the subsequent seventeen years of his life, and died at Newport, Rhode Island, 10 September, 1870.—J. H. B.

[3] John Torrey was born in New York City, 15 August 1796. As a boy he became interested in botany and chemistry. When he was only twenty years old, and a student of medicine, he was one of the group of young men, who, under the leadership of Professor Mitchill, organized the Lyceum of Natural History, now the New York Academy of Sciences, and within a year, as one of the members of a committee appointed by the Lyceum, prepared a catalogue of plants known to occur within thirty miles of New York City. Upon receiving his degree, in 1818, he entered upon the practice of medicine in New York City; from 1824 to 1827, he was professor of chemistry

letters from G. W. Hulse[1]. Writing from Fort Brooke (now Tampa), East Florida, under date of June 10, 1837, he said:

"I should apologize for the small offering that I am about to send you, but I always dislike making excuses. The few seeds that I send are from the plant that is indigenous in Florida and called the *Arrow Root*. Perhaps they will vegetate with you and give you opportunity of saving the plant itself. It grows abundantly near Cape Florida, the mouth of the Withlacoochee and Sawanee Rivers. Quite extensive establishments were fitted up at the Cape before the war for the purpose of manufacturing the root into starch (or rather flour) which is said to be a very simple process, merely grinding or grating the roots, then washing, precipitating and drying. The article when prepared is said to be equally as good as the *Maranta Arundinacea*, though this I believe is quite a different plant. It is said that it grows best on sandy light soil. I have seen some roots that would weigh several pounds.

I send you also a sample of Seminole Flour which was taken from the stores of the enemy at the Big Cypress near Tohope-

and mineralogy at West Point; from 1827 to 1873, professor of chemistry at the College of Physicians and Surgeons (now the Medical Department of Columbia University); for some years also concurrently professor of chemistry at Princeton; botanist of the geological survey of New York State; and from 1857 to 1873, United States Assayer at the New York office. In spite of the fact that his professional work was all in medicine, chemistry, and mineralogy, his first interest was always in botany, to which he devoted all the time he could find for the purpose for more than fifty years, publishing numerous books and papers, and gaining a world-wide reputation in this science. He was the first president of the Torrey Botanical Club, which was named in his honor. He died in New York City, 10 March 1873.—J. H. B.

[1] Gilbert White Hulse was born 12 March 1807, in BloomingGrove township, near Washingtonville, Orange County, New York. He studied medicine at the College of Physicians and Surgeons in New York City, receiving his degree in 1835,. He immediately entered the medical service of the United States Army, being stationed at Tampa Bay from February to April, 1836, in Arkansas during the summer and fall of the same year, returning to Fort Brooke, Florida. In 1837 he went again to Fort Gibson, Arkansas, returning to Fort Brooke in January, 1838. He was at Tallahassee in March, and before the middle of the year 1838 had settled as a medical practitioner at Rodney, Mississippi. Later he was a planter in Louisiana, and about 1850 he visited northern California, where he collected plants for Torrey as he had done in Florida and Mississippi. Throughout the Civil War he was a surgeon in the Confederate Army, and at its close., his property gone, he returned north, making his home at first with his sister, Mrs. Moffatt, at Rockford, Illinois, and later with her daughter, Mrs. Knapp, at Auburn, New York, where he died 13 November 1883.—J. H. B.

Ka-Lija Lake on the 28th of January. It is made, I believe, from a plant which is a species of Briar very abundant in the south and in Florida, grows best in the rich Hammock land, and if we should judge its use by the establishments that we have seen for preparing it, we should say it was a staple article with the Seminoles. It is called by them *Conti Chatee* or Red Root whilst the arrow root which is also much used by them is called *Conti Hateka* or White Root."

A letter written early in the following year from Tallahassee, March 7th, 1838, said: "I owe you many apologies for having delayed so long to acknowledge your favour of the 22nd of August last. It did not reach me however, till the 3rd of January when I was at New Orleans on my return from Fort Gibson to Fort Brooke E. F.

"It affords me real satisfaction to say to you, I have according to your request been able to collect and forward you some specimens of the plant *Zamia integrifolia*.

"They were sent by the Brig Wm. Penn which sailed from St. Marks for New York on the 5th inst. In the collection I have been careful to take an assortment of both sexes or males and females having the strobiles so well developed that in case they reach you without injury (on board of the vessel) you will be able to see much that is peculiar and interesting in the botanical character of the plant. They are from two different localities: those with large, long, roots are from the sandy pine woods; those from the sea shore (mouth of Withlacoochee) grew very near the salt water and upon the beds of oyster shells and in consequence have small roots.

"I regret that I have not been able to furnish you with some more of the ripe fruit or seeds. The few that I sent you with the other (last) parcel are all that I have seen. The fruit is an oblong shape and when ripe nearly the size of a grain of gourd seed corn."

Under date of July 7, 1838, Dr. Hulse wrote from Rodney, Mississippi, as follows:

"My last letter to you was from Tallahassee (Fla.) to which I have received no answer. It was dated about the middle of March, a little previous to which time I sent you by a vessel (Brig Wm. Penn) from St. Marks to N. Y. a qu ntity of the *Zamia* put up as you directed."

Referring to the "Perrine Grant" a reservation in southern Florida, intended for growing useful plants from the tropics, he continues:

"It is my opinion however, that the *Zamia integrifolia* will be found a no less important plant than many of those proposed to be introduced." This statement is partic larly interesting since

the pinelands of the "Perrine Grant" naturally abounded in zamia, and the supply has been generously drawn on for several generations.

There is scarcely any doubt that some of the material of zamia referred to in the preceding letters of Dr. Hulse reached New York before Asa Gray sailed for Europe. It was doubtless some of that material that Dr. Gray took to Geneva. At any rate, the tracing of the type specimen of *Zamia floridana* indicates the plant that is common in the pine woods east of Fort Brooke where the writer has collected it.

One of the more interesting statements in one of the above letters is that referring to the two habitats of the *Zamia* in question. As just stated, the pineland plant represents *Z. floridana*. The one growing in the oyster shells at the mouth of the Withlacoochee may represent another species.

There is a sheet in the Torrey herbarium with two rather poor leaves representing two species of zamia, and the record "Florida Dr. Hulse & Dr. Burroughs." These leaves may be from the two kinds of plants with dissimilar "roots" mentioned in Dr. Hulse's letter of March 7, 1838. Whether the leaves came from the plants when they were sent to Dr. Torrey, or whether they were from the "roots" grown under glass at New York we shall never know. One leaf has narrow, few-veined leaflets, the other has them broader and many-veined.

What part Dr. Burrows played in this *Zamia* puzzle we do not know, as there are none of his letters preserved in the unpublished Torrey correspondence at the Garden and he is not referred to in the Hulse letters. Of course, it is possible that the two leaves were sent in independently. If the leaves do not represent the plants referred to in above cited letter, Dr. Hulse may have sent the one with narrow leaflets to Dr. Torrey and Dr. Burrows the one with broad leaflets, or vice versa.

William Bartram found zamia on the western side of the State as well as on the eastern. While wandering in the wilderness east of the Suwannee River he records that he "had an opportunity this day of collecting a variety of specimens and seeds of vegetables, . . ., particularly Sophora, Cistus, . . . Zamia, . . ."[1] The writer found zamia in this region several years ago.

[1] William Bartram, Travels through North and South Carolina, Georgia East and West Florida 246. 1792.

*Zamia* has been rather an elusive plant in Florida. For many years only two general localities were associated in literature with the geographic distribution of the two generally recognized species, whereas the plants are widely scattered over the peninsula.

The two species just referred to are quite distinct. The one, with broad and many-veined leaflets, occurs most abundantly in the hammock-belt of the Halifax River on the upper eastern coast. Curiously enough this was the Florida cycad field most easy of access in the early days, but that *Zamia* was referred to only by William Baldwin, as *Zamia pumila*, and to this day the species has not received a name that can be retained for it, as it differs from the true *Zamia pumila* L. of the West Indies.

The other species, with narrow and few-veined leaflets, the one that figured prominently in the early botanical literature and correspondence, a plant of the pinelands, was discovered not far from the Halifax River region, just across the watershed separating the Saint Johns River from the eastern coast, and named *Zamia integrifolia*, by William Aiton in 1789. It was discovered independently some fifty years later evidently near the western coast, directly west or southwest of the Halifax River region, and named *Zamia floridana*, by Alphonse De Candolle, in 1868. The most interesting fact in connection with the geographic distribution of this species is that its greatest abundance is at the very opposite extremity of the peninsula from the place of its discovery. The natural growth of zamia on the Everglade Keys is phenomenal—perhaps the most luxuriant in existence. There it was and is so abundant that starch or flour has been manufactured from it for ages under the name of "Conti-hateka" or "Coontie" by the red man, aborigines and Seminoles, and "Florida arrow-root" by the white man. It is sometimes recorded that the plant was there cultivated, but all our information is to the contrary. The natural abundance evidently deceived some observers. This exceptional abundance was observed long ago, for on some of the early maps the region which we now know as the Everglade Keys bore the significant legend "Koontee or Hunting Grounds!"

The writer has been gathering evidence concerning the geographic distribution of *Zamia* in Florida for several years.

The evidence in hand indicates major phytogeographic regions: I. For *Zamia integrifolia* Ait., discovered by John Bartram, —the pinelands as noted above locally throughout the peninsula, with the plants most abundant near the northern and southern ends, with a northward extreme at Perry in Taylor County and a southern outlying extreme on Big Pine Key. II. For *Zamia umbrosa* Small[1], discovered by William Baldwin, as noted above, —the temperate hammocks of the upper eastern coastal region with outlying extensions in the Saint Johns water-shed and the Ocklawaha water-shed. III. For *Zamia media* Jacq., of the West Indies, discovered in Florida in 1917, by C. A. Mosier, John De Winkeler and the writer,—the tropical and semitropical hammocks of the lower eastern coastal region.[2] IV. For an undetermined species of *Zamia*—the tropical everglade prairie hammocks of the Cape Sable region.

Rumored more northern localities for *Zamia integrifolia* and *Z. umbrosa* await verification. The former species has been reported as growing south of De Funiak Springs, western Florida and the latter north of Saint Augustine, eastern Florida.

Thus, one after another some of the mysteries have been solved. The one, however, connected with the general distribution of these plants over the state is unsoluable. Whether, after they were generally established, subsequent to the immigration of their ancestors from the West Indies, they have increased in range or abundance, naturally, or through the agency of the aborigines, as a cultivated crop, or have decreased through natural agencies or through the abuse of the supply by the aborigines, we shall never know. However, at present it is clear that the plants are most abundant at the sites of the former places of settlement or activity of the aborigines.

[1] **Zamia umbrosa** n. sp. Plant with arching, dark-green leaves: leaflets typically numerous, the blades narrowly spatulate at least broadened upward, 20-30-veined, finely several-toothed at the apex: mature, ovulate cones ellipsoid or cylindric, 1-2 dm. long, or rarely smaller, scarcely umbonate.—Hammocks, shell-middens, and sand-dunes, northeastern peninsular Florida.—Type specimen from Hammock, between Volusia and Ocean City, Florida, J. K. Small & J. B. DeWinkeler, May 4, 1821.

[2] Journal of the N. Y. Bot. Gard. **18**: 102. 1917.

Zamias are ornamental as well as esculent plants. In Florida they are commonly cultivated in gardens, not only in the localities where they grow naturally, but at distant points. They decorate the front yards of both humble and pretentious houses, planted either in clumps or as hedges. When the Everglade Keys were settled, every one had fine plants of *Zamia integrifolia* in his front and back yards. These usually grew so plentifully that it was a case of eliminating instead of introducing the plants.

The plant thrives in cultivation. Garden specimens often surpass in luxuriance any seen in their natural habitats. Thus we have found such specimens of *Zamia integrifolia* in Apalachicola and in Perry in northern Florida, and likewise in towns down through the peninsula. *Zamia umbrosa* is in cultivation west of its natural range in Gainesville and in Ocala. Northward of its geographic range it may be seen in abundance in the gardens of Saint Augustine and in Jacksonville, and even in the little, remote, but old, settlement of Mayport at the mouth of the Saint Johns River.

Numerous inquiries in Saint Augustine and in Jacksonville brought out the fact that the cultivated plants were brought originally from the Halifax River region, but long before the present owners or occupants of the premises were there.

The individual plants grow rapidly from seed. Seedlings may become mature enough in two or three years to bear cones, even under unfavorable conditions. They, too, seem to be long-lived, and several centuries may not be too great an estimate. An evidently old plant, moved to a garden in Pasco County, Florida, over thirty-five years ago thrived and was sent to the to the New York Botanical Garden within the past few years but unfortunately, was frozen en route.

Under natural conditions the plants are scattered broadcast by the dispersal of their seeds by various anima's; but vegetative propagating may be easily accomplished. The curious-looking caudex is evidently a much abbreviated and condensed plant axis, for it may be sliced into numerous wafers, each of which will promptly develop into a new individual if planted. It seems strange that in spite of these numerous nascent buds, the caudex of our zamias is either simple or very sparingly branched, both in the wild and in cultivation.

JOHN K. SMALL.

# THE NEW HORTICULTURAL GARDENS ENTRANCE AND FENCING ON THE SOUTHERN BOULEVARD.

WITH PLATE 260

The fencing of the southern part of the garden reservation, along the Southern Boulevard and Pelham Parkway, made necessary by largely increasing numbers of visitors and the protection of plantations and of natural features was commenced last autumn, and is being continued. The fence is of the same design as that built in previous years along the property line of Fordham University on the southern side of the garden and along the Bronx Boulevard on our eastern boundary; it is composed of a low rubble-stone wall, built on a concrete foundation and topped by a coping, with square piers of Yonkers granite about twenty-five feet apart surmounted by caps, and with bays of iron railing about seven feet high. The new fencing differs from the old in that the coping and pier caps are of artificial cast stone instead of granite.

The new work was commenced at the Southern Boulevard Entrance and about five hundred feet of fencing has now been completed, including a path entrance to the Horticultural Gardens. This entrance consists of two cut cast stone piers seventeen feet apart. Work on the continuation of this fence southward is in progress and it is hoped to complete about two hundred and fifty feet more of it this season. Over this length and beyond toward Pelham Avenue the fence will rest for the most part on a natural rock foundation.

The cut cast stone piers at the Horticultural Gardens Entrance and about three hundred feet of the fence were built by the expenditure of a bequest of $5,000 by Mrs. Mary J. Kingsland, appropriated by the Board of Managers for this purpose. A bronze tablet, affixed to one of the piers bears the following inscription.

This Entrance and
fence were built
1920-1921
through a bequest of
Mary J. Kingsland
New York Botanical Garden

The New Horticultural Garden Entrance and Fencing on the Southern Boulevard

The tablet was unveiled during the Spring inspection of Grounds, Buildings and Collections on May 6th, 1921, by Mrs. Theron G. Strong, Secretary of the Women's Auxiliary.

The rest of the fence completed has been built by expenditures from the income of the Russell Sage and Margaret Olivia Sage Memorial Fund, and the work in progress is being financed from this income.

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## THE 1921 DAHLIA BORDER

The 1921 dahlia border is at the date of writing (July 15) well established and, after the incipient drought of the first three weeks of June, has been receiving a supply of rainwater sufficient to meet its needs. About sixty of the nearly five hundred varieties that were carried through the winter were rejected, not that they were really poor varieties, but because among the newer creations of the last two or three years there seemed to be better ones, to the growing of which our limited space might better be devoted. The missing numbers have been more than made up by contributions from various friends and patrons of the border, among whom may be mentioned Judge Josiah T. Marean, Green's Farms, Conn.; Mr. J. J. Broomall, Eagle Rock, California; Mr. F. P. Quinby, White Plains, N. Y.; Mrs. Charles H. Stout, Short Hills, N. J.; Mr. W. J. Matheson, Huntington, N. Y.; Mills & Co., Mamaroneck, N. Y.; Miss Emily Slocombe, New Haven, Conn.; Mr. Alfred E. Doty, New Haven, Conn.; Mr. C. Louis Alling, West Haven, Conn.; Mr. Alt F. Clark, Netcong, N. J.; Mr. Emmett Dove, Rockville, Md.; Mrs. A. F. Story, Brockton, Mass.; Capt. J. R. Howell, Bayshore, N. Y.; Mrs. S. T. Cushing, Islip, N. Y.; Mr. R. Vincent, Jr. & Sons, White Marsh, Md.; Dahliadel Nurseries, Vineland, N. J.; and The Dahlia Farm, East Moriches, N. Y. The dahlia border this year includes 502 varieties, represented by 824 plants. It is believed that the addition of numerous tested novelities from such well-known originators as Broomall, Marean, Slocombe, and Stout, together with other promising new varieties that have been perhaps less thoroughly tried out, will serve to maintain the interest of the New York public in the Garden's dahlia bor-

der and will also do much to assist the public to keep in touch with the most recent perfections in the development of this popular flower.

MARSHALL A. HOWE

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## AUTUMN LECTURES

Illustrated lectures free to the public will be delivered in the lecture hall of the museum building on Saturday and Sunday afternoons at four o'clock during September and October as outlined below. The following lecturers are to be with us for the first time: Mr. John Dunbar, of the Rochester Park System; Dr. Edgar T. Wherry, of Washington; Prof. T. Gilbert Pearson, President of the Audubon Society; Dr. H. M. Denslow; and Miss Frances B. Johnston.

During November, lectures will be given in Conservatory Range 2 on Sunday afternoons at a quarter past three o'clock. Mr. Arthur Herrington will open the series with a talk on "Chrysanthemums," illustrated with a collection of living plants and cut flowers.

### REGULAR COURSE

Sept. 3. How to Grow Rhododendrons. Mr. John Dunbar
Sept. 4. The Classification of Plants. Dr. W. A. Murrill
(With Museum Demonstration)
Sept. 10. How to Grow Wild Flowers. Dr. E. T. Wherry
Sept. 11. English Gardens. Miss Hilda Loines
Sept. 17. Some Interesting Plants of Our Local Flora.
Dr. F. W. Pennell
Sept. 18. The Fight for American Bird Protection.
Prof. T. G. Pearson
Sept. 24. Dahlias and Their Culture. Dr. M. A. Howe
(Exhibition of Dahlias, September 24 and 25)
Sept. 25. Our American Gardens. Miss F. B. Johnston
Oct. 1. The Uses of Plants. Dr. W. A. Murrill
(With Museum-Demonstration)
Oct. 2. A Popular Talk on Mushrooms. Dr. W. A. Murrill
Oct. 8. Loco Weeds. Dr. Arthur Hollick

Oct. 9. Health and Disease in Plants. Dr. A. H. Graves
Oct. 15. Autumn Coloration. Dr. A. B. Stout
Oct. 16. Rice, the Most Important Food Plant.
Dr. H. A. Gleason
Oct. 22. Our Local Orchids. Dr. H. M. Denslow
Oct. 23. Gathering Wild Flowers in the Tyrolean Mountains.
Dr. W. A. Murrill
Oct. 29. Florida Vegetation. Dr. J. H. Barnhart
Oct. 30. The Influence of Climate on Evolution.
Dr. W. A. Murrill

### Greenhouse Lectures

Nov. 6. Chrysanthemums. Mr. Arthur Herrington
Nov. 13. Tropical Vines. Mr. K. R. Boynton
Nov. 20. Cycads. Dr. W. A. Murrill
Nov. 27. Variegated Plants. Dr. A. B. Stout

Conservatory Range 2 is situated at the eastern side of the Botanical Garden, north of the Allerton Avenue Entrance. It is most conveniently reached from the Allerton Avenue Station on the White Plains Extension of the Subway from East 180th Street. Visitors coming by train to Botanical Garden Station should inquire at the Museum Building.

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## NOTES, NEWS AND COMMENT

On the afternoon of July 13, a group of about sixty students from the Columbia University Summer Session visited the Garden under the leadership of Mr. L. A. Crawford, assistant to the director of the Summer Session. The party was met at the Elevated Railway Station by members of the Garden Staff and escorted through Conservatory Range 1, the Herbaceous Grounds, the Rock Garden, the Iris Garden, the Hemlock Grove, and the Museum Building.

By exchange of duplicate specimens with the Smithsonian Institution, the herbarium has recently been enriched by over 1200 specimens collected in Haiti last year by Mr. E. C. Leonard. This is one of the largest collections ever made in Haiti, and it contains specimens of a good many species not previously re-

presented in our collections and many other specimens of rare trees and shrubs endemic in Haiti. It is very valuable to us at the present time in connection with our studies of the flora of Cuba and of that of Porto Rico.

*Meteorology for June*: The total precipitation for the month was 3.02 inches. The maximum temperatures recorded for each week were as follows: 84° on the 4th, 88° on the 12th, 87° on the 13th, and *98° on the 22nd*. The mimimum temperatures were *45½° on the 3rd*, 50° on the 7th, 53° on the 16th and 60° on the 21st.

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## ACCESSIONS

### Plants and Seeds

60 plants for Fern Garden. (Given by Mr. C. A. Weatherby.)
18 plants for Iris Garden. (Given by Rev. C. H. Demetrio.)
13 plants for Iris Garden. (Given by Miss Grace Sturtevant.)
4 plants for Iris Garden. (Given by Mrs. D. A. Filler.)
3 plants for Iris Garden. (Given by Mr. S. G. Harris.)
20 plants for Iris Garden. (Given by Mr. John C. Wister.)
3 plants of *Clinopodium*. (Given by Mr. W. M. Buswell.)
45 plants for Fern Garden. (Given by Mr. H. E. Ransier.)
1 plant for Iris Garden. (Given by Mr. Frank H. Presby.)
2 plants for Iris Garden. (Given by Mrs. W. G. Du Mont.)
4 plants for Iris Garden. (Given by John Lewis Childs Inc.)
16 plants for Iris Garden. (Given by Mrs. Horatio G. Lloyd.)
11 plants for Iris Garden. (Given by Mr. J. Marion Shull.)
2 plants for Iris Garden. (Given by Mr. Geo. N. Smith.)
6 plants for Iris Garden. (Given by Bobbink and Atkins.)
104 plants for Iris Garden. (Given by Mr. John C. Wister.)
16 plants of *Hymenocallis*. (By exchange with Mr. W. Kimball.)
107 plants for Conservatories. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)
3 plants of *Zamia*. (By exchange with Mr. Bathusa through Dr. J. K. Small.)
4 plants of *Hymenocallis*. (By exchange with Mr. J. Arthur Harris.)
6 plants for Conservatories. (By exchange with Florida Wild Life League.)
44 plants derived from seed
1 pkt. of seed. (Given by Mr. Samuel F. Clark.)
1 pkt. of *Alpinia* seed. (Collected by Dr. N. L. Britton.)
1 pkt. of seed. (By exchange with Mr. Hubert Buckley.)
1 pkt. of seed. (By exchange with U. S. Dept. Agric.)
70 pkts. of seed. (By exchange with B. G., Oxford, England.)
200 pkts. of seed. (By exchange with B. G., La Mortola, Italy.)

50 Dahlia plants, 24 varieties. (Given by Judge Josiah T. Marean.)
27 Dahlia roots, 18 varieties. (Given by J. J. Broomall.)
20 Dahlia roots, 15 varieties. (By exchange with Mr. F. P. Quinby.)
13 Dahlia roots and plants, 13 varieties. (Given by C. Louis Alling.)
12 Dahlia roots and plants, 7 varieties. (Given by Mr. Alt F. Clark.)
11 Dahlia roots, 6 varieties. (Given by The Dahlia Farm.)
10 Dahlia roots, 9 varieties. (Given by Slocombe Dahlia Gardens.)
10 Dahlia roots, 8 varieties. (By exchange with Dr. M. A. Howe.)
9 Dahlia roots, 7 varieties. (By exchange with Mrs. S. T. Cushing.)
7 Dahlia roots and plants, 7 varieties. (Given by Mr. Alfred E. Doty.)
7 Dahlia roots, 6 varieties. (Given by Mills & Co.)
7 Dahlia plants, 3 varieties. (Given by R. Vincent, Jr. & Sons.)
6 Dahlia roots, 6 varieties. (Given by Mr. Emmett Dove.)
6 Dahlia roots, 4 varieties. (Given by Dahliadel Nurseries.)
6 Dahlia roots and plants, 2 varieties. (Given by Mr. W. J. Matheson.)
5 Dahlia roots, 4 varieties. (Given by Mrs. A. F. Story.)
5 Dahlia roots, 3 varieties. (Given by Capt. J. R. Howell.)
3 Dahlia roots, 3 varieties. (Given by Mrs. Chas. H. Stout.)
3 Dahlia roots, 3 varieties. (By exchange with Miss Margaret S. Brown.)
2 Dahlia roots, 2 varieties. (By exchange with Miss Rosalie Weikert.)
2 Dahlia roots, 1 variety. (Given by George Smith & Sons.)
2 Dahlia roots, 2 varieties. (By exchange with Prof. J. B. S. Norton.)
2 Dahlia roots, 2 varieties. (Given by the Garden Club of Ridgewood, N. J.)
2 Dahlia roots, 2 varieties. (By exchange with Mr. L. H. Du Bois.)
2 Dahlia plants, 2 varieties. (Given by Mr. C. Frey.)
1 Dahlia root. (By exchange with Mr. Otto Pfannkuchen.)
1 Dahlia root. (Given by Dr. W. A. Orton.)
4 plants of *Dahlia imperalis* for Conservatories. (Given by Mr. W. J. Matheson.)
71 plants from Florida. (Collected by Dr. J. K. Small & De Winkeler.)
273 Lily Bulbs. (Purchased.)
3 plants of *Dracaena* for Conservatories. (By exchange with B. E. Blaine Bros.)
16 plants. (By exchange with U. S. Dept. Agric.)
48 plants for Conservatories. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)
1 plant of *Opuntia*. (By exchange with Mr. E. T. Wherry.)
4 bulbs of *Oxalis tuberosa*. (By exchange with U. S. Dept. Agric.)
4 bulbs for Conservatories. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)
14 plants derived from seeds.
6 plants for Conservatories. (Given by Mr. H. W. Becker.)
4 plants for Conservatories. (Given by Mr. Charles Fett.)
4 plants for Conservatories. (Given by Julius Roehrs Co.)
1 plant of *Pandanus Victoria* for Conservatories. (Given by Mr. Wm. B. Thompson.)

67 plants of Cacti. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)

102 plants for Conservatories (By exchange with Mr. Samuel Untermyer.)

15 plants of *Opuntia Drummondii.* (Collected by Mr. D. W. Gross.)

3 plants of *Juglans major* for Nurseries. (Given by Mr. Willard G. Bixby.)

97 plants of *Hicoria* for Arboretum. (Given by Mr. J. F. Jones.)

2 plants of *Hymenocallis* for Conservatories. (Given by Bro. W. Wolf.)

10 plants of *Hicoria* for Arboretum. (Given by Vincennes Nurseries.)

3 plants for Nurseries. (Given by Mr. J. McCarthy.)

1 plant of *Acer rubrum* for Nurseries. (Given by Mr. Chas. C. Dean.)

13 plants of *Cotoneaster* for Fruticetum. (Given by Cottage Gardens Co.)

1 plant of *Iris flavissima* for Iris Garden. (Given by Mrs. C. S. McKinney.)

10 plants of *Hicoria* for Arboretum. (Given by The McCoy Nut Nurseries.)

8 plants of *Hymenocallis* for Conservatories. (Given by Bro. Knapke.)

3 plants for Nurseries. (Given by Mr. E. P. Martin.)

1 plant for Conservatories. (Given by Mrs. Geo. H. Plympton.)

1 plant of *Vaccinium crassifolium.* (Given by Gertrude W. Wilkens.)

15 plants of *Opuntia.* (Collected by Mr. D. W. Gross.)

1 plant of *Pediocactus Simpsonii.* (Collected by Mr. Joseph A. Holmes.)

8400 Gladiolus bulbs. (Given by Mr. A. E. Kunderd.)

6 plants of *Vitis* for Nurseries. (Purchased.)

27 plants for Arboretum and Nurseries. (Purchased.)

49 plants for Conservatories. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)

53 plants for Conservatories. (By exchange with Missouri Bot. Garden.)

31 plants for Conservatories. (Given by Mr. P. H. Rolfs.)

16 plants of *Fragaria vesca.* (Given by Mrs. J. W. Martens.)

9 plants for Iris Garden. (Given by Mr. D. M. Andrews.)

153 specimens of Japanese Iris. (Given by Mr. Bertram H. Farr.)

5 plants for *Dionaea muscipula.* (Given by Mr. George Tilles.)

4 plants for Iris Garden. (Given by Mrs. T. Bodley.)

218 plants. (Purchased.)

50 plants for Conservatories. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)

1 plant of *Rhododendron.* (By exchange with U. S. Dept. Agric.)

2 plants of *Hymenocallis* for Conservatories. (By exchange with U. S. Dept. Agric.)

52 Florida plants. (Collected by Dr. J. K. Small.)

4 plants of *Opuntia* from Florida. (Collected by J. K. Small and De Winkeler.)

1 packet of *Granadilla* seed. (Given by Mrs. Barsett.)

1 packet of seed. (Given by Mr. F. F. Von Vilmorsky.)

90 packets of seed. (By exchange with B. G., Ottawa, Canada.)

1 packet of seed. (By exchange with Mr. H. G. Wolfgang.)

1 packet of *Linum* Seed. (By exchange with Mr. M. Hawks.)

3 packets of seed. (By exchange with Mr. D. T. A. Cockerell.)

3 packets of seed. (By exchange with Mr. Samuel Untermyer.)

62 packets of seed. (Purchased.)

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## 1. Benefactors

The contribution of $25,000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a benefactor of the Garden.

## 2. Patrons

The contribution of $5000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a patron of the Garden.

## 3. Fellows for Life

The contribution of $1000.00 or more to the funds of the Garden at any one time shall entitle the contributor to be a fellow for life of the Garden.

## 4. Fellowship Members

Fellowship members pay $100.00 or more annually and become fellows for life when their payments aggregate $1000.00.

## 5. Sustaining Members

Sustaining members pay from $25.00 to $100.00 annually and become ellows for life when their payments aggregate $1000.00.

## 6. Annual Members

Annual members pay an annual fee of $10.00.

All members are entitled to the following privileges:

1. Tickets to all lectures given under the auspices of the Board of Managers.
2. Invitations to all exhibitions given under the auspices of the Board of Managers.
3. A copy of all handbooks published by the Garden.
4. A copy of all annual reports and Bulletins.
5. A copy of the monthly Journal.
6. Privileges of the Board Room.

## 7. Life Members

Annual members may become Life Members by the payment of a fee of $250.00.

## Information

Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

## Form of Bequest

**I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....**

Vol. XXII August, 1921 No. 260

# JOURNAL

OF

# The New York Botanical Garden

EDITOR

R. S. WILLIAMS

*Administrative Assistant*


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WALTER S. GROESBECK, *Clerk and Accountant*
ARTHUR J. CORBETT, *Superintendent of Buildings and Grounds*
KENNETH R. BOYNTON, *Supervisor of Gardening Instruction*

Geo. N. Nash.

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# GEORGE VALENTINE NASH

WITH PLATE 261

The New York Botanical Garden and the Horticultural Society of New York have sustained a grievous loss in the death on July 15th, 1921, of Mr. George Valentine Nash, Head Gardener and Curator of the Plantations. He had served the Garden continuously since 1896, first during its preliminary organization, as a General Assistant, next during 1900, as Curator of the Plantations, then during twenty years as Head Gardener, to which title that of Curator of the Plantations was added in 1921. He thus took a very importat part in the bringing together of the collections of living plants and in their installation and maintenance.

Mr. Nash was born in Brooklyn, New York, May 6, 1864. Much of his boyhood was spent at Clifton, New Jersey, where his father conducted a horticultural business in which he was employed, specializing in roses and in water plants; his attention was thus early drawn to Botany and he was fortunate in coming about the year 1888 under the influence of the eminent Dr. George Thurber, for many years editor of the American Agriculturist, a profound botanical student and an enthusiastic collector, especially of grasses. Mr. Nash quite naturally inherited Dr. Thurber's interest in grasses, receiving from him a large part of his extensive grass herbarium, and this interest continued for many years, until his other duties forced it to one side. He

diligently studied the wild plants of New Jersey, and he became a member of the Torrey Botanical Club in 1891; at about this time my acquaintance with him commenced; for several years thereafter he brought specimens to me for identification, and during this period he determined to take the first opportunity which offered to enter botanical science as a profession. He gradually succeeded in accomplishing this through various errands and commissions, not free from discouragement, but he was very persistent. His most noteworthy effort in this direction was his collecting of botanical specimens in sets for sale, in Central Florida, during parts of the years 1894 and 1895; he studied these large and important collections at the herbarium of Columbia College with some help from me, and the sets, containing specimens of many rare species, were sold to good advantage, enabling him to continue his botanical studies. The opportunity came for a remunerative position when the work of the New York Botanical Garden was initiated in 1896.

His first important errand as an employee of the Garden was in 1901, when, after an invitation by Sir William Thiselton-Dyer, Director of the Royal Botanic Gardens at Kew, England, we sent him to that institution for study, and to select a large number of living plants duplicated in the Kew Collections, for the formative collections in The Bronx;[1] this accession was very important, including over 1000 species, and many of the plants obtained there by Mr. Nash at that time are still living with us. In the autumn of 1901 he accompanied Dr. John K. Small to Florida and they collected over 1200 specimens of living plants, with many museum and herbarium specimens.[2] On a second European trip in 1902 he studied and obtained plants in exchange from the Botanical Gardens at Kew, Edinburgh, Cambridge, Brussels, Paris, Utrecht, and other institutions,[3] over 1500 species in all. He made important and successful collecting expeditions to Haiti in 1903,[4] to the Bahamian Islands, Inagua and

[1] Journ. N. Y. Bot. Gard. **2**: 65-69. 1901.
[2] Journ. N. Y. Bot. Gard. **3**: 29-35. 1902.
[3] Journ. N. Y. Bot. Gard. **3**: 141-145. 1902.
[4] Journ. N. Y. Bot. Gard. **4**: 205-215. 1903.

Little Inagua in 1904,[1] with Mr. Norman Taylor, and to Haiti and the Turks Islands in 1905,[2] again with Mr. Taylor.

The development of the plant collections of the New York Botanical Garden, their botanical identification, labeling and recording, the accumulation of herbarium specimens of the plants cultivated, public lectures and demonstrations, and replies to inquiries for information about plants have fully occupied Mr. Nash's time in recent years. With Dr. Barnhart he has edited "Addisonia" since the commencement of that periodical in 1916; he has personally superintended the newer plantations of roses, gladioli and other horticultural features, and he gave much attention to the orchid collection. Since May, 1909, he has been Secretary of the Horticultural Society of New York, has edited its Journal and taken a prominent part in its exhibitions.

His contributions to the literature of Botany and of Horticulture number over 180 titles, the most extensive being his contributions of descriptions of grasses to "North American Flora,"[3] and his successive annual reports as Head Gardener of the New York Botanical Garden published in its Bulletin; his writings cover a very wide range of plant knowledge.

He is commemorated in Botany by the genus *Nashia* of the Verbena Family, dedicated to him by Dr. Millspaugh,[4] and by several species of West Indian and Floridian plants, first made known by his exploration work.

N. L. Britton.

Extract from the Minutes of the Scientific Directors of the New York Botanical Garden at their Meeting of October 8, 1921

Whereas: Mr. George Valentine Nash, for many years Head Gardener of the New York Botanical Garden, died on July 15th, 1921

Resolved: That the Scientific Directors of the New York Botanical Garden deeply deplore the loss of a highly esteemed and much beloved associate.

[1] Journ. N. Y. Bot. Gard. **6**: 1-19. 1905.
[2] Journ. N. Y. Bot. Gard. **6**: 170-191. 1905.
[3] N. A. Fl. **17**: 77-198. 1909-1915.
[4] Field Museum Publ. Bot. **2**: 176. 1906.

RESOLVED: That the foregoing preamble and resolution be entered upon the minutes of the Directors, printed in the Garden *Journal*, and that a copy be sent to his bereaved family.

RESOLUTION ADOPTED BY THE DIRECTORS OF THE HORTICULTURAL SOCIETY OF NEW YORK:

The members of the Horticultural Society of New York regret having to record the death of Mr. George V. Nash, who for a number of years did such efficient work as Secretary, in keeping the records, and editing the publication, and we herewith wish to express our appreciation of his services in building up the Society, arranging for the scientific lectures, and the able manner in which he conducted the numerous exhibitions.

We wish also to convey to Mrs. George V. Nash and family, our sincere sympathy, and direct that this resolution be entered upon the minutes of the Society and that a copy be sent to Mrs. Nash.

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## STUDIES OF GRAPES IN COOPERATION WITH THE STATE EXPERIMENT STATION AT GENEVA, N. Y.

WITH PLATE 262

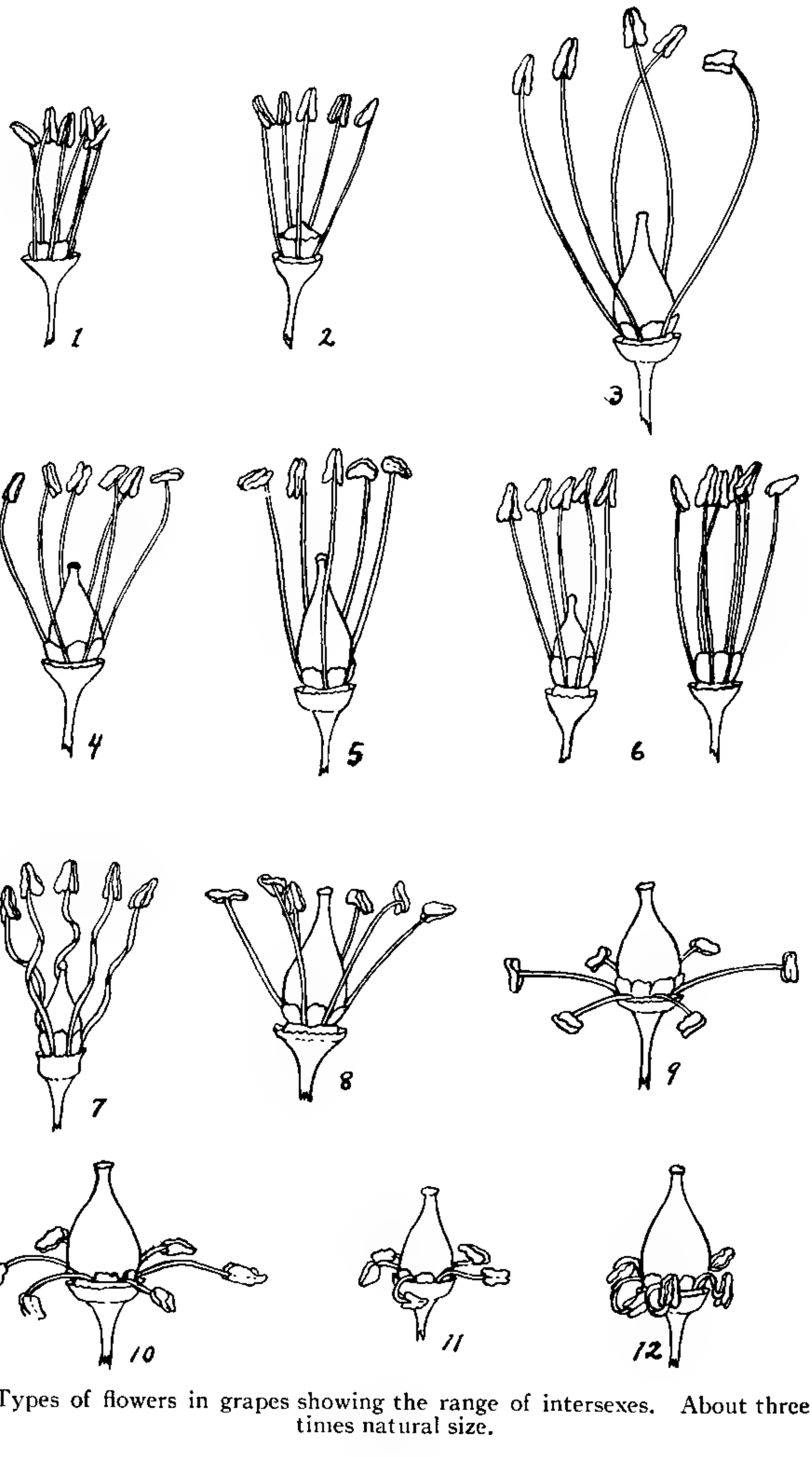
DR. N. L. BRITTON, DIRECTOR-IN-CHIEF:

*Sir*:

Since the autumn of 1919 I have, with your permission, engaged in studies of grapes in cooperation with the Department of Horticulture of the State Experiment Station at Geneva, N. Y. In prosecuting this research I have been at Geneva for periods of from ten days to two weeks each spring and autumn. The studies have already given some very definite evidence regarding the types of flowers in grapes with particular reference to fruit development and have rather clearly indicated what is probably the most effective course in breeding for the development of seedless varieties.*

The matter to which I first directed attention was a survey of

* A more extended report than is here presented has recently been published as Technical Bulletin No. 82 of the New York Agricultural Experiment Station, the same being contribution No. 231 from the New York Botanical Garden.




Types of flowers in grapes showing the range of intersexes. About three times natural size.

the types of flowers with reference to the functioning of the parts (pistils and stamens) in fruit production. There is abundant material for such a study in the vineyards of the Station. Nearly all the named varieties of grapes cultivated in Northern United States are represented; many varieties of European grapes are successfully grown out of doors by providing protection during winter; and there are also several thousand seedlings of flowering and fruiting age whose immediate parentage is known. All these are being carefully studied by members of the Station staff with special reference to the quality of fruit and the general value of seedlings as new varieties for culture. Breeding of grapes, involving many of these stocks, which has been in progress at Geneva for some years is being continued. The particular studies which I am making correlate very closely with the studies and experiments in progress at the Station, and they are a continuation of the main lines of research on sterilities which I have prosecuted during the past ten years.

In making the survey of the types of flowers, the general form of the flower produced by a plant or variety was first studied as to length and size and position of pistils and stamens. The pollen contained in freshly dehisced anthers was examined under a microscope to determine its appearance and its viability was tested by a method of artificial germination. The power of pistils and ovules to function was judged by the production of fruit and seeds to open pollination under field conditions.

The survey revealed (a) at least one type of flower not hitherto known or recognized and which is designated as having crinkled stamens, (b) a wide range of variation among flowers classed as perfect hermaphrodites in the length of stamens and the character of their pollen contents, and in the character of pistils in respect to fruit produced, and (c) various intermediates between the typically upright and the reflexed types of stamen. Of special interest and importance is the determination of the types of flowers that produce seedless or near-seedless fruits.

The general range in flower types may be illustrated by the flowers figured in the accompanying plate (Plate 262) all of which are drawn to the same scale and enlarged about 3 times.

The purely staminate type of flower, shown in Fig. 1, has erect stamens and the pistil is either much aborted or lacking. In

many flowers classed as staminate, rudimentary pistils are to be seen as in Fig. 2. Plants with such flowers only are entirely fruitless but usually the stamens contain good pollen and the plants are highly fertile as male parents in cross-pollination.

The flowers shown in Figures 3, 4, and 5 are nearly identical in general appearance. All have erect stamens with much viable pollen in the anthers and hence maleness is well developed. The pistils are present and apparently fully developed, but the fruits produced are different. Those of 3 are seedless or at least contain mere rudiments of seeds; those of 5 contain seeds and often the number per fruit is four; the plant with flowers all of which appear as shown in Fig. 4 produces fruits that are near-seedless; that is, many are seedless and none have more than two or 3 seeds. No. 5 is the type that most closely approaches the condition of the perfect hermaphrodite. The others differ chiefly in respect to the internal development of the pistil as revealed by the type of fruit produced.

The type of flower shown in Fig. 12 has strongly reflexed or recurved stamens. The anthers are often poorly developed and as far as known now all or nearly all the pollen is shrunken and devoid of contents and hence impotent in this sort of flower but the pistils of such flowers are very generally capable of producing seeded fruits provided they are properly pollinated with good pollen. This type of flower has long been called the imperfect hermaphrodite. Between the typical hermaphrodite (Fig. 5) and the imperfect hermaphrodite (Fig. 12) there are many intermediates. This is most obvious in respect to the position of anthers. Types with spreading and strongly spreading or revolute stamens as shown in Figures 8, 9 and 10, occur.

What appears to be a new type of flower for grapes was found. In this (See Fig. 7) the filaments of the stamens are ascending but are twisted or crinkled in irregular and incomplete spiras. The anthers are of good size and appear to be perfectly formled but in all instances observed to date they contain only shrivelled and impotent pollen. Plants with this type of flower may function as females producing various types of fruits but are unable to function as male or pollen parents.

There exists in the seedling grapes grown at Geneva many gradations in respect to the relative development of stamens

(male organs) and pistils (female organs). At one end of the series is the staminate type of flower which is highly potent only as a male. At the other end is the type with reflexed stamens which is highly potent only as a female. Between these are many intergrades of which the type of flower giving seedless fruits, the perfect hermaphrodite, the type with revolute stamens and the one with crinkled stamens are readily to be recognized.

Such variations in the relative morphological development of the essential parts of a flower may be termed phenomena of intersexualism. In the extremes the condition approaches dioecism. The loss of sex, as compared with the hermaphrodite, tends strongly to be one-sided. Within certain limits, various grades of one or the other sex are to be seen with any particular grade of the other sex; for example, pistils that are fruitless or that yield seedless, near-seedless or fully seeded fruits may be found among fiowers that have either refiexed stamens or erect stamens.

For the most part, flowers in grapes are rather uniform in type for the entire seedling individual or the variety which is, of course, propagated vegetatively. But variations in intersexes are not uncommon among the flowers borne on a single vine. The two flowers shown at No. 6 are from the same flower cluster; one is staminate and fruitless, the other appears to be a perfect hermaphrodite. As far as observed in grapes, the variations among flowers of a single plant involve pistils rather than stamens.

The most important of the cultivated varieties of northern grapes are all perfect hermaphrodites with erect stamens. The pistils and the stamens are highly functional and so the individual vines are all self-fruitful. Frequently, however, plants that have reflexed stamens bear fruits of unusually good quality. But when these are propagated as varieties the vines are unable to set fruit unless cross-pollinated and hence they should be grown intermingled with vines having perfect flowers or staminate flowers. For example vines of Brighton will yield fruit only when thus grown. In vinyeards this variety and others also having flowers with reflexed stamens should be grown intermingled with perfect flowered varieties like Concord, Niagara,

and Diamond, but even then the fruiting will be poor if the blooming is not simultaneous or if weather conditions check cross-pollination.

Plants and varieties having reflexed stamens have very generally been called "self-sterile." The term has also been applied to certain varieties of apples, plums, pears and various other cultivated plants and also wild species in which the flowers are perfect hermaphrodites but in which the organs (pistils and stamens and their contents) are *incompatible* in fertilization. The term "self-sterile" hence describes an observed result but does not distinguish the conditions giving rise to it. In the grapes, self-fruitlessness is due to incomplete development of either pistils or stamens and is hence due to a morphological defect accompanying intersexualism. In the other cases mentioned the sterility is relative and involves physiological incompatibilities operating between organs and sex elements that are morphologically perfect and fully functional in certain other relations.

The presence of intersexes in these seedling grapes raises the question as to the origin or cause of intersexualism. In wild species of grapes native to northern United States no such variations are known; only the staminate and the reflexed types of flowers have been noted; plants that have flowers of the perfect hermaphrodite type and that are unquestionably wild have never been found. How the perfect flowered varieties such as the Concord, Delaware, and Catawba originated has therefore been considered a mystery by many horticulturists. It is now clear that they may have arisen in either or both of two ways:

(1) Hybridization between wild grapes such as the fox grape (*Vitis labrusca*) and varieties of the European grape (*V. vinifera*), may have given some progeny having flowers of the type of the *vinifera* parent but with the hardiness of the *labrusca* parent. It is now known that most varieties cultivated in north-eastern United States have *vinifera* in their parentage.

(2) It is also possible that intersexes may exist among wild species of *Vitis* to greater extent than has been discovered or recognized. It seems certain however that perfect hermaphrodites and various grades of intersexes are more frequent in seedlings of mixed parentage such as are grown at Geneva than in the native species.

It is, however, possible that variations giving intersexes in grapes have arisen as a result of hybridization between the American species of grapes and the European varieties in which the grades of sex in the flowers of the parents were quite different. But intersexualism is a frequent phenomenon and in many cases it is common in what appears to be pure species. Its origin seems to be more deep-seated and fundamental than mere hybridity.

With the more complete recognition of the presence of intersexes in grapes it becomes desirable, if not necessary, to determine as fully as possible how the development of a particular kind of flower and fruit may be regulated, controlled or infiuenced by breeding and by the selection of parentage. As a result of studies of the inheritance of sex in grapes, chiefly conducted at the Geneva Station, this is already very well determined for the perfect hermaphrodite and for reflexed types which produce seeded fruits. But for the production of seedless varieties this remains to be determined and it is to this problem that I am now directing special attention.

The time is most opportune for such an effort. There are no varieties of seedless grapes hardy to Eastern United States now in cultivation. The seedless varieties of *V. vinifera* now grown on a considerable scale in California are not hardy here, but their fruits are finding ready sale in the Eastern markets for use as table grapes. The seedless character of grapes will undoubtedly increase in popular favor for the entire pulp of such fruits can be masticated with greater ease and relish than is the case with the seeded fruits. It happens that all of the seedless *vinifera* varieties are of such ancient origin that there is no direct evidence of how and from what flower types they were obtained.

One method of attempting to secure hardy seedless sorts readily suggests itself. That is to use vines of the *vinifera* seedless sorts as pollen parents in crosses with hardy varieties that are seed producing (either perfect or imperfect hermaphrodites). The use of *vinifera* varieties of seedless grapes in such crossing has not yet been tested and this will be attempted. In crosses of this general character already made at Geneva, the plants of

the $F_1$ progeny were strongly pistillate, yielding seeded fruit. The weak femaleness seen in the seedless or near-seedless plants used as pollen parents was dominated or swamped by the strong femaleness of the seed parent. It is the plan to grow the progeny in later generations and in these seedlessness may appear.

But a few plants bearing only seedless or many seedless fruits already exist among the seedlings in the vineyards at the Geneva station. These are fully hardy in the climate of New York State, and while the quality of the fruit produced by them is good, it is scarcely good enough to give them high rank as commercial varieties. However, these plants may prove highly valuable in the work of breeding. Most individuals which produce a good yield of seedless or near-seedless fruits are strongly staminate and this is also the case with the well known seedless varieties of the European grape. For the development of seedless fruits in these, pollination is necessary and the best yield of seedless fruit is hence in plants in which the seedless grade of pistil is combined with stamens that are highly male.

Such plants can, therefore, be used as male parents in crosses with the near-seedless plants which do produce a few viable seeds from which progeny may be grown. Plants strongly male but whose fruits are seedless can be crossed with plants strongly male and near-seedless and also the self-fertilized progeny of the latter may be obtained. In this way families weak in femaleness will undoubtedly be obtained in which a considerable number of individuals will produce seedless fruits. Thus it is through the selection of parents in the interbreeding of the seedless with the near-seedless that the possibility of securing types with the degree or kind of femaleness which exists in the seedless types seems most promising. With this accomplished the further selection is to be directed to such characters as qualities of fruit, abundance of yield and hardiness of vine. A start was made last spring in breeding along these lines and it appears that this is the first breeding to be undertaken with these particular methods and aims in mind.

A brief report can be made here in regard to the culture of grapes in the New York Botanical Garden, and the purposes which this would serve.

(A) *Outdoor plantings.* In these there should be a collec-

tion (a) representing the wild species, (b) the principal cultivated varieties hardy to this section and (c) several varieties of the *vinifera* sorts which can be grown successfully by providing protection in winter. Such plantings would furnish material of general interest and educational value, particularly in demonstrating the best methods of grape culture, especially of the *vinifera* grapes. The vineyard would furnish material for critical studies of species, for intensive studies in the morphology and cytology of the pistils of the various flower types, for a cytological study of fertilization and for special experimental studies regarding the best time for pollination. Considerable breeding could also be done to supplement that done at Geneva. It is not the intention to attempt the growing of seedlings in our vineyard; that will be done at Geneva where facilities are ample for their successful culture on a large scale.

I am pleased to report that some progress has been made in establishing a plantation of grapes in our Garden. A few vines of several varieties have been purchased, and some of these are already bearing fruit. Cuttings of others have been supplied by the State Experiment Station at Geneva. Through the kindness of the officials of the U. S. Department of Agriculture and of the Experiment Station of California, cuttings of all the most important of the seedless varieties of *vinifera* grapes have been obtained and are now growing in a nursery. It is the plan to space these properly in a small vineyard and to construct proper supports for the vines. Perhaps a third of the area of the present experimental plots can be used for this vineyard. A fence giving complete protection should be provided in the near future.

(B) *Culture of grapes in a hot house.* Growing of certain varieties of the less hardy European grapes in a hot–house is undoubtedly a matter of considerable interest to many persons who visit our Garden. To demonstrate such culture would be of special educational value.

One of the difficulties of obtaining pollen of such seedless varieties as the Sultanina for use in breeding is that when the vines are grown outdoor they usually bloom later than vines of the more hardy cultivated varieties and of the near-seedless seedlings. Because of this condition it was impossible to make,

during last spring at Geneva, a large number of the desirable crosses as planned. Before these can be accomplished it may be necessary to grow the seedless varieties to be used as pollen parents under hot house culture so controlled that they bloom at the proper time. A hot house specially devoted to the growing of grapes would hence greatly promote the breeding of grapes along the lines discussed above.

It takes several years to bring plants of the grape to blooming and fruiting age from seed. For the breeding studies a large number of seedlings must be grown and these require considerable space. There is ample provision for providing and maintaining the large vineyards necessary for the breeding work on the grounds of the Experimental Station at Geneva. The seed obtained in the breeding of plants grown in our Garden will be germinated at Geneva and the seedlings will be grown there.

In concluding, I wish to acknowledge with appreciation the hearty cooperation which has been given by the various members of the Station Staff at Geneva and especially that by Professor U. P. Hedrick, Mr. Richard Wellington, Mr. H. B. Tukey and Mr. H. O. Sprague of the Department of Horticulture with whom I have most closely been associated in these studies.

Your permission to engage in this research is appreciated. Permission to continue the cooperation and facilities for culture of grapes in our Garden along the lines mentioned above are requested.

Respectfully submitted,
A. B. STOUT,
*Director of the Laboratories.*

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## THE "WORKING" OF LONG LAKE

During the months of July, August, and September, 1921, the waters of Long Lake, in the southeastern part of the New York Botanical Garden, remained conspicuously murky. Long Lake is a body of water about 900 feet long and 200 feet in average width, occupying an old glacial basin reinforced by artificial damming at the south end, and without obvious inlet or outlet. At the north end a drive-way is under construction and a rather

deep fill of rock and of yellowish brown soil extending into the water might naturally have given rise to the impression that the yellowish brown murkiness of the water was due to the erosion of this newly made and similarly colored bank. However, the muddiness of the water was essentially uniform throughout the lake and it persisted continuously and almost uniformly without much regard to rainfall or movements of the air. When a vial of this water was held towards the light and examined with a hand lens it was found to hold in suspension great numbers of very delicate short threads and when the water was run through filter paper it left upon the paper a delicate yellowish brown film similar in color to the water of the lake when viewed in mass. There was a small quantity of other organic and inorganic particles but the muddiness of the water was evidently due for the most part to the presence of these minute rods or threads. Examinations with the higher powers of the microscope and comparison with descriptions, figures, and available specimens led to the determination of the organism as *Oscillatoria prolifica* (Grev.) Gomont, one of the blue-green algae. The filaments, each made up of a single row of minute cells, are mostly .08 to 0.8 mm. long and 3 to 4 micromillimeters broad. They are rather rigid or slightly flexuous and are blunt-pointed, although Gomont, who identified similar specimens from Jamaica Pond (Massachusetts) with this species, described the filaments as finally capitate and his only figure shows a filament with a flattened "head" or "calyptra." But in an examination of two specimens from Jamaica Pond (Farlow, Anderson, and Eaton, Alg. Exsicc. Am. Bor. no. 229, issued as *Oscillatoria diffusa* Farlow; and Collins, Holden, and Setchell, Phyc. Bor.-Am. no. 154, issued as *Oscillatoria prolifica*) the present writer finds no capitate filaments. The filaments are not constricted at the septa, the cells are about as long as broad or a little longer and they are conspicuously and remarkably vacuolate. Two, three, or four vacuoles occupy a large part of nearly every cell and the presence of these little bubbles of gas in the cell protoplasm is probably a factor of importance in keeping the filaments suspended in the water.

*Oscillatoria prolifica* was first described and figured by Greville in 1827, under the generic name *Lyngbya*, from a lake in Scot-

land. In America its occurrence, so far as the present writer can determine, has previously been recorded from only two localities. The first of these was Jamaica Pond, near Boston, where it is said to have been first observed in 1884 by the late Professor Farlow, who distributed it under the name *Oscillatoria diffusa* Farlow, for which no diagnosis appears ever to have been published. Its second recorded occurrence in America was by Dr. Edgar W. Olive who reported[1] it in 1905 as giving a reddish tinge to ice of Pine Lake, Waukesha County, Wisconsin.

It appears that the reddish tinge in the ice was so conspicuous as to lead to its being regarded with suspicion and distrust by some of those who had cut it for summer use. Dr. Olive remarks that "Pine Lake is similar in one respect to Jamaica Pond, viz., in that neither has any outlet to speak of ." It is of interest to note that Long Lake, in another state, the third American lake in which *Oscillatoria prolifica* has been observed, also has no "outlet to speak of."

The chief point in which the New York specimens appear to differ from others previously described under the name *Oscillatoria prolifica* is the color. As first described by Greville, the Scotch plant is said to be "purple" and Greville's colored figure of a mass of the filaments is a sordid chocolate-purple. The living plant of Jamaica Pond in its mass effects has been described as "light reddish-brown,"[2] "of a decided chocolate hue,"[2] "reddish,"[3] and "brownish chocolate-color,"[3] while that of Long Lake is mostly a yellowish brown. However, the color of the blue-green algae is known to vary considerably according to conditions of growth, and the correspondence in size, form, and structure between the plants causing the chocolate murkiness of Jamaica Pond in Boston and the yellowish brown murkiness of Long Lake in New York City is so striking that there can be little or no doubt as to their specific identity. Experiments by

[1] Notes on the occurrence of *Oscillatoria prolifica* (Greville) Gomont, in the ice of Pine Lake, Waukesha County, Wisconsin. Trans. Wisconsin Acad. **15**: 124-134. Dr. Olive gives a valuable bibliography of the "working" or "flowering" of lakes, to which list may be added a paper by the present writer entitled "A note on the 'flowering' of the' lakes in the Adirondacks," Torreya 3: 153–154. 1903.

[2] Moore, Geo. T. Rhodora **1**: 100. 1899.

[3] Olive, E. W. Trans. Wisconsin Acad. **15**: 128. 1905.

Schindler[4] indicate that a yellowish or yellowish brown color in members of the *Oscillatoria* family accompanies a diminished food supply.

MARSHALL A. HOWE.

## NOTES, NEWS AND COMMENT

The automobile seems to be exacting its toll of death among various of the lower animals as well as among the highest. Within a space of less than a mile of road in the Garden, remains of the following animals have been noticed in the last week or two, namely—one house rat, four snakes, all perfectly harmless, and numerous frogs and toads, of which often only fragments are to be seen here and there. With the exception of the rat, termed the most destructive animal in the world by the United States Department of Agriculture, it is evident there is a great loss of life over the country at large, from the above cause, of many small animals highly beneficial to the communities in which they live.

A year or so ago, even a screech owl was found flattened out by some machine. It was apparently the show-owl of the Garden, which disappeared about the same time from the entrance to its home in a hollow tree, where previously it could almost constantly be seen through the day by interested visitors. Mud turtles also are occasionally found, victims to the silent, swiftly moving wheels.

More than thirty kinds of oaks growing in the Arboretum have reached such a size now that they are of much interest to all tree-lovers.

Dr. H. A. Gleason, Assistant Director, is back from British Guiana after a successful trip of some three months in that region, spent in collecting botanical specimens for the Garden.

Dr. Arthur Hollick has completed his work in Washington on the fossil flora of Alaska and is again a member of the Garden staff.

[4] Schindler, B. Über den Farbenwechsel der Oscillarien. Zeitsch. für Bot. 5: 497–575. 1913.

Mr. E. J. Butler, Director of the Imperial Bureau of Mycology, Kew, England, who has made a tour of parts of the United States in the interest of pure mycology, visited the Garden on August 18 and sailed shortly afterward for England.

Dr. K. Miyabe, Professor of Botany in the Imperial University at Sapporo, Japan, called at the Garden August 20 and 22 on his return from the Conference of Cereal Diseases held at St. Paul, Minnesota. He sailed from San Francisco September 17, having been in the United States since the first of July.

The following visiting botanists have enrolled in the library during the summer months: Professors M. F. Barrus, H. M. Fitzpatrick, Romyn Hitchcock, J. R. Schramm and D. S. Welch, Ithaca, N. Y.; Dr. J. N. Rose, Dr. J. S. Cooley, W. W. Eggleston and Fred R. Jones, Washington, D. C.; Dr. Helen M. Gilkey, Corvallis, Ore.; Prof. Theo. D. A. Cockerell, Boulder, Colo.; Prof. E. A. Burt, St. Louis, Mo.; Prof. John W. Harshberger and class, Philadelphia, Pa.; Prof. James P. Kelley, State College, Pa.; Prof. Francis E. Lloyd, McGill University; Prof. R. Ruggles Gates and E. J. Butler, London, Eng.; Professors Arthur de Jaczewski and N. Vavilov, St. Petersburg, Russia; Rev. Dr. S. J. Enander, Lillherrdal, Sweden, and Professors Kingo Miyabe and Makato Nishimura, Sapporo, Japan.

*Meteorology for July.*—The total precipitation for the month was 1.76 inches. The maximum temperatures recorded for each week were as follows: *97° on the 4th*, 89° on the 17th, 92° on the 24th, and 96° on the 28th. The minimum temperatures were: *58° on the 6th*, 60° on the 17th, 59° on the 22nd and 68° on the 30th.

*Meteorology for August.*—The total precipitation for the month was 4.73 inches. The maximum temperatures recorded for each week were as follows: 85° on the 4th, 86° on the 12th, 89° on the 19th, 82°on the 24th, and *93° on the 30th*. The minimum temperatures were: 55° on the 4th and 5th, 51° on the 15th, 53½° on the 16th, and *50° on the 23rd*.

# Members of the Corporation

Dr. Robert Abbe,
Fritz Achelis,
Edward D. Adams,
Charles B. Alexander,
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# JOURNAL

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# The New York Botanical Garden

EDITOR

R. S. WILLIAMS

*Administrative Assistant*

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# BOTANIZING IN BRITISH GUIANA

For the investigation of the flora of northern South America, now being undertaken by the New York Botanical Garden in cooperation with the National Museum and the Gray Herbarium of Harvard University, no section of the mainland is easier of access or offers greater facilities for the collector than does British Guiana. While it lacks the great diversity of Colombia and Ecuador in climate and topography, it has the great advantage of the English language, which is spoken by practically all the inhabitants.

I sailed from New York June 2, 1921, and an unusually quick voyage carried me to Georgetown in eleven days. This city is well known to travellers and much has been written about the coastal lowlands, so that they may be passed here without further word, except a reference to the article by Professor A. S. Hitchcock in this journal (**21**: 129–137. 1920.).

The only regular line of transportation to the interior is maintained by Sprostons, Ltd. This company also owns the few hotels and resthouses along the line, so that the traveller must depend on them almost entirely for his transportation and his personal comfort, unless he desires to resort to the slow and expensive method of providing his own boat, crew, and outfit. Instead of abusing this monopoly, Sprostons have made it cheap, easy, and unexpectedly comfortable to travel some 150 miles into the interior. Every traveller is "personally conducted," and all their employes are continuously ready to offer their services cheerfully and effectively in any way needed.

River steamers on the Demerara River run three times a week as far as Wismar. The third day after my arrival saw me on the crowded saloon deck of the "Essequibo," while on the second class deck below a mob of negroes, East Indians, and mixed races swarmed and gossiped and sang. Among them were my two Spanish-Arawak men from the northwest district, whose service I had secured through the assistance of the Forestry Officer, Mr. L. S. Hohenkerk.

As one steams up the mile-wide river, glimpses of plantations and sugar factories may be had occasionally through the fringe of forest or "bush" along the shore. Conspicuous in the bush are the two mangroves, *Rhizophora* and *Avicennia*, indicating that the water is still brackish from the tidal flow. The influence of the tide is in fact felt as far as Wismar, where the rise and fall amounts to six feet, although the water is perfectly fresh.

A few islands are passed, the river narrows down to a quarter of a mile or less, and the mangroves are replaced by a giant arum, (*Montrichardia*) known here as mucka-mucka. This plant bears leaves like the calla lily, its close relative. It grows in a dense thicket along the river bank, with stems four to five inches in diameter and over twenty feet high. Behind the arum, cultivated ground becomes less and less frequent, and soon the tropical bush is almost unbroken, except for occasional small clearings of negro planters and charcoal burners. Conspicuous in the bush along shore are the ite and kokerite palms, both productive of fruits valuable for their oil, and the tall slender stems of pumpwood, surmounted by a cluster of huge leaves. The latter, under its generic name *Cecropia*, is well known to both botanists and entomologists for its interesting development of myrmecophily. The stems are hollow and divided into chambers by transverse partitions at each joint. Through a thin spot in the stem above each joint ants gain access to the interior and use the chambers for their nests. They open passages from one to the other and gradually move up as the tree grows taller, thereby keeping their activities near the summit of the stem. This habit is well known to the Indians, who carefully avoid handling the plants, or for that matter any other plants which are habitually infested with ants, and long experience has made the Indians exceedingly wise in this respect.

In the late afternoon, after repeated stops to discharge freight and passengers into waiting boats and dugout canoes, we reached a large clearing with good buildings and a sawmill, the village of Christianburg. A short distance beyond it lies Wismar, the head of steamer navigation, and across the river is the city of Mackenzie, built by and for the Demerara Bauxite Company, but at the time of my visit almost deserted.

At Wismar, the Demerara and Essequibo rivers are less than twenty miles apart, and Sprostons have built a railroad connecting them. This has the strategic advantage of leaving the Demerara below the first rapids and reaching the Essequibo above its first obstruction, thereby giving a clear route for many miles up the latter stream. An hour's delay, and we were off on a diminutive train drawn by a proportionately small engine. The chief diversion for the other passengers was dodging the hundreds of sparks from the wood-burning locomotive. Being fortunate in securing a comparatively spark-free corner, I was able to devote some attention to the interesting sandhill vegetation. The railroad climbs a steep grade to the crest of the broad ridge of sand which forms the divide between the two rivers, and an hour later descends to the floodplain forest of the Essequibo, reaching its terminus at Rockstone, where a comfortable hotel is provided.

Early the next morning we left on the launch "Piamah." The five first-class passengers occupied a houseboat towed alongside, the launch itself was tightly packed with negroes, and on the other side a large boat was in tow, full of freight for a balata estate far up the river. Rockstone soon disappeared behind us and then for mile after mile the river, well over a mile wide, rolled its mighty current between solid walls of absolutely virgin forest. An impenetrable mass of foliage, bound by vines and creepers, rose up from the water's edge and was so dense that one was seldom able to see a tree trunk behind it. A few vines only were in bloom. Parrots screamed overhead, monkeys appeared in the thicket and chattered at the launch, king-fishers and herons foraged over the water, but of human life there was none.

After eighteen miles of this interesting but monotonous panorama of tropical life, its continuity is broken by the clearing

of Butukari, where Sprostons maintain a lumber camp. Then the rain began to fall in torrents, and except for a few brief intervals we sat the rest of the day behind close-drawn curtains, while the overloaded launch fought its way upstream. Seven hours were needed for the next thirty miles and we reached Omai as darkness was falling. We crawled slowly up Tiger Falls and Crab Falls, and after eight o'clock reached Potaro Mouth, where we discharged the balata boat and many of our passengers. Then we turned up the Potaro river into the inky blackness of a tropical rainy night and at ten finally reached the launch terminus at Tumatumari. Fortunately for us the rain stopped at this time, and it was with great relief that we climbed the hill and sat down in comfortable chairs to await the preparation of a very late dinner.

For the four following weeks Tumatumari was my headquarters and from it I explored the bush in every direction. My usual plan was to leave the resthouse by half past six, collect plants all morning, return about noon, and devote the rest of the afternoon to the care of my collections. I used throughout a method of pressing and drying developed by myself in 1904, and differing but little from that used by Hitchcock and described by him in the article already cited. Most plants were dry 30 hours after collection, a few more quickly, and only such fleshy plants as orchids and aroids required a longer time.

Who can adequately describe the tropical forest? Not the botanist certainly, with his tendency to a botanical viewpoint and terminology, nor the poet, with his failure to understand all the botanical wonders about him. The task must be done, if it ever is, by a Burroughs, who combines a knowledge and a love of nature with his grasp of the language and power of expression.

Great trees arise on every side, but no greater than in the American forests. Under them is a dense array of young trees and shrubs, mostly straight and slender and so closely set together that vision extends only a few yards in any direction. On nearly every tree are woody climbers, their leaves completely lost to sight in the general mass of foliage overhead. In the crotches, on the trunks, and still more abundantly on the upper branches are numerous epiphytic plants of orchids, aroids, bromeliads, and ferns; on the ground a mass of fallen trees and

limbs, a thin layer of leaf mold, and a very few delicate herbaceous plants. No breeze can be felt, not a sunfleck appears on the ground, frequently even the location of the sun can not be determined. Leave the trail but a few yards and it is lost, only to be found by retracing one's steps or by resorting to the compass, which must always be carried. But only by leaving the trail and hewing the way with cutlass through the bush does one become fully impressed with its immensity, its solitude, and the relentlessness and completeness with which it surrounds and engulfs the explorer. Surely they are hardy men who set off on expeditions through the trackless Guiana forests. Even the native Indians stay closely to their ill-defined trails, and their folklore abounds with tales of their adventures when lost in the bush and beset with wild beasts and the still more terrible bush spirits.

From the collector's standpoint, the bush at Tumatumari is too uniform to make it a desirable field for work. Ecologically, it seems to represent a single plant association, with a great similarity in floristic composition throughout. Even the usual lowland vegetation along the river is almost completely lacking, since the Potaro flows through a narrow valley without a flood-plain. Successful collecting was further hampered by the season. I was told in Georgetown, and soon confirmed it in the bush, that the rainy season is not the blooming period for the vast majority of plants. Collecting was extremely slow, merely from lack of material in suitable condition, and my pressing outfit was seldom operated to its full capacity. Nevertheless, the lack of material made for more careful observation, and it is probable that some species were secured that would have been completely overlooked in a more prolific season. Field glasses were constantly used, and flowers or fruits discovered high up in the trees along the edge of clearings. These my Indians obtained by climbing or felling the trees. They entered heartily into the spirit of the work, and voluntarily and cheerfully devoted much time to securing specimens. Their crowning feat was swimming out into the rapid current of the Potaro, then twenty feet above low water mark, climbing from the water into a large tree, passing a series of bromeliads infested with ants, and bringing down from a height of fifty feet flowering branches of the tree.

Collecting was further handicapped by the incessant rains, the summer proving to be one of the rainiest ever experienced in the colony. Rain fell every day without exception, and we repeatedly returned to the resthouse drenched. The Potaro rose beyond the top of the gauge, and the Essequibo stood continuously for seven weeks above the highest mark reached on many previous years. The rainfall here lacks the remarkable diurnal periodicity of parts of the East Indies, and falls at any time of the day or night. However, it appears to be concentrated in the early morning and late afternoon hours, so that in general the mornings were available for field work

The best collecting was invariably found along trails, where a little more light favored plant growth, and good results were obtained by collecting from a boat along the bank of the rivers.

One short excursion was made to Potaro Landing, and another as far as Kangaruma. A launch plies on the Potaro from Tumatumari to the Landing, a distance of ten miles. A government road, passable for vehicles, extends thence some fifteen miles to the works of the Minnehaha Gold Company. In its first half mile it crosses outcrops of red ochre, and here are growing some ferns (*Gleichenia*) and a *Selaginella* not seen elsewhere in the district. A short distance farther a well made footpath leaves the road and traverses over five miles of virgin forest to Kangaruma. Here Sprostons maintain a resthouse for the use of travellers to and from Kaietuk Falls, located in a small clearing occupied by a few families of Macusi Indians. Interesting collections were obtained here, both of native plants and of weedy species invariably associated with the Indian clearings.

July 12 I left Tumatumari, and aided by the powerful currents, reached Rockstone by two o'clock, and made this place my base for the next three weeks. Here the Essequibo River is bordered by a belt of alluvial ground nearly a mile wide, but completely flooded at the time of my visit. The lowland flora, quite different from the hill flora along the Potaro, could be collected only from the railway embankment or from a boat along the river bank. Back of the floodplain, a narrow belt of rolling hills is occupied by the usual plants of the Potaro district, but with numerous species not observed at my first station. Still farther back, and occupying a strip some fifteen miles wide be-

tween the Essequibo and Demerara Rivers, lies the area of sand-hills already mentioned. The tri-weekly passenger train carried us to them early in the morning, we would collect till nearly mid-day, and walk back to Rockstone in time for a belated lunch.

Fires have swept over the area at various times, and it is popularly considered that the open vegetation with considerable expanses of bare sand have been caused in this way. While this may be largely true, fires can not account for all features of the topography or for the unusual flora. For some fourteen miles there is not a watercourse, even with an annual rainfall of about 100 inches, while many of the common species of plants occur nowhere else in the district. The prevailing tree is dacoma, congeneric with the well known mora, but quite unlike it in general habit. An interesting feature of the plant life is the prevalence of ground orchids, apparently of the genera *Cyrtopodium* and *Catasetum*, with large erect pseudobulbs as much as two feet high, surmounted by panicles or racemes of yellow flowers. The catasetums have flowers much resembling an American lady-slipper, not inverted, and are known to the Indians as monkey-goblets. They are eagerly visited by bumble-bees, which are more numerous than the flowers, and consequently many an aerial battle is waged for the right to gather the catasetum nectar.

From Rockstone a two-day's visit was made to Butukari, where Sprostons have a large timber grant. Their chief output is greenheart, known the world over for its remarkable strength and durability, especially when immersed in salt water. Logs up to 90 feet long may be obtained, or shorter ones squaring up to 24 inches. Numerous other valuable woods are obtainable, of which crabwood, wallaba, and purple heart are the most important. The logs are dragged out by hand or steam winch to the little logging railroad and thence to the river, where they are stored under water, since most of the important woods of the colony sink. For shipment they are lashed to timbers placed cross-wise of large punts, but are kept submerged to reduce the apparent weight.

Animal life is abundant in the bush, and I frequently regretted that I had no means of learning names for the numerous species

of birds that flew about the resthouses. Jaguars were occasionally seen in the vicinity; large and small monkeys and howling baboons were common; opossums and acouri were seen occasionally. Small green lizards were everywhere; the large salapenters occasionally came around the houses in search of young chickens; alligators were common at Rockstone, where one was killed on the kitchen steps; even the large cayman bellowed beneath the Rockstone hotel at night. Of live snakes I saw only five, none of which was poisonous. Vampire bats were common about the verandas at night, while several species of frogs kept up a constant chorus from sunset till sunrise. Mosquitoes and other insects were at no time troublesome.

Numerous residents of British Guiana gave me much assistance in various ways and at various times, while every one whom I met evinced a kindly interest in my work and did much to make my stay in the colony pleasant. The members of the latter category are too numerous to record, but for actual assistance it is a pleasure to mention Mr. L. S. Hohenkerk, chief forestry officer, Mr. Robert Ward, superintendent of the Botanical Garden, Mr. A. J. Darrell, of Tumatumari, and Professor Sir John B. Harrison, Director of Science and Agriculture.

HENRY ALLAN GLEASON.

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## ALONG THE JUNIATA RIVER

The largest known plant of the now celebrated box-huckleberry (*Gaylussacia brachycera*) is hidden in a mountain ravine along the Juniata River in Perry County, Pennsylvania. This station was visited by the writer during last August (1921). The huckleberry plant covers many acres of the northern slopes of the ravine. In fact, the few known plants of the box-huckleberry all occupy hillsides facing the north. The specimen in question is considered a relic of antiquity.[1] It is an interesting plant, particularly in regard to its geographic distribution, its habitats, its morphologic characters, its habits, and its relationships.

[2] See Addisonia **6**: 17-18. *pl. 201*. 1921.

On the opposite side of the ravine where it opens on the river there is a high cliff or bluff made up of fine shale—a Mecca for geologists from far and near, for it contains an inexhaustible store of interesting fossils.

In passing by this cliff our attention was attracted by what the horticulturalists would doubtless call a giant-flowered evening-primrose. It was in full bloom and presented a striking appearance. The narrow leaves were bright-green and the flowers, between three and four inches in diameter, were a clear yellow. In all its characters and habit it was quite different from any plant before found in Pennsylvania, with the flora of which we are well acquainted. Besides growing on the cliff just mentioned this evening-primrose occurred on many of the small shale outcrops up and down the Juniata. It proved to be *Oenothera argillicola*, heretofore known only from the vicinity of White Sulphur Springs, West Virginia, where it was first discovered less than twenty years ago.

Another evening-primrose (*Cenothera biennis*) was ubiquitous, and, as is often the case, its foliage was copiously infested with a mildew. The large-flowered primrose, however, was wholly free from any visible pest and was exceptionally vigorous.

The Juniata Valley is rich in flowering plants. Its floristics would furnish a fascinating field for study, and, if properly interpreted would make an entertaining as well as instructive document. At the time of our visit mosses were much in evidence and the rock-loving species, such as the grimmias,were well represented. Ferns were nearly everywhere. Not fewer than ten kinds were abundant. Among them may be mentioned the polypody (*Polypodium vulgare*), lady-fern (*Athyrium Filix-foemina*), maidenhair-spleenwort (*Asplenium Trichomanes*) cbony-spleenwort (*A. platyneuron*), Christmas-fern (*Polystichum acrostichoides*), maidenhair fern (*Adiantum pedatum*), evergreen wood-fern (*Dryopteris marginalis*), flower-cup fern (*Woodsia obtusa*) and hay-scented fern (*Dennstaedtia punctilobula*).

Although it was mid-season—the least floriferous time of the year—goldenrods were blooming and asters were beginning to open their stars, particularly *Aster lateriflorus* and the more showy *A. prenanthoides*. On the cliffs, that harbinger of spring, the common rock-cress (*Arabis lyrata*) was found here and there

in full flower. Its usual associate, the columbine, (*Aquilegia canadensis*) still held its fruits and showed an occasional flower, while the shooting star (*Dodecatheon Meadia*) was represented merely by a few leaves. The ledges of the cliffs were carpeted by the starry-stonecrop (*Sedum ternatum*) in fine leafage, and among it were often clumps of the wild onion (*Allium cernuum*) with its nodding, pink to purple cluster of flowers.

At the base of the cliff many plants had accumulated in the talus. The extremes were represented, in size, by the quite minute, depressed, forked-chickweed (*Anychia canadensis*) and the tall halberd-leaved hibiscus (*Hibiscus militaris*), which was strongly suggestive of its relative the wild-cotton of Florida.

In the bottom of the ravine the humble Indian-tobacco (*Lobelia inflata*) was tangled with the grasses, while the cardinal flower (*Lobelia cardinalis*) elevated its flaming torches three or four feet above the accompanying vegetation. In the water along the river shore were pondweeds (*Potamogeton*) and the water-willow (*Dianthera americana*).

On the river banks were naturalized exotics and weeds. The mint family was copiously represented by the ground ivy (*Glecoma*), catnip (*Nepeta*), and four species of the true mint (*Mentha*). Among native mints were several kinds of mountain mint (*Koellia*), pennyroyal (*Hedeoma*), blue-curls (*Trichostema* and germander (*Teucrium*).

Now to revert to the showy principal of this note: In the mountains further south it has several associates—plants endemic in the White Sulphur Springs region. They are *Eriogonum Allenii, Pseudotacnidia montana, Senecio antennariifolius, Trifolium virginicum*, and *Viorna ovata.*

Might it not be that these rare plants still lurk on some of the unexplored mountains of Perry County, or possibly they once grew there in company with the box-huckleberry and the evening primrose, and are now extinct. Our suspicion as to their presence or former presence in the Juniata Valley is strengthened by the fact that the station where the box-huckleberry was first found was in the more southern part of Blue Ridge, in the same mountain range, but somewhat further north than the localities where the interesting plants just mentioned, now occur.

Several hundred plants of the box-huckleberry were brought

back and planted in the Garden. Also, a quantity of rosettes of the large evening-primrose was secured from which we will have flowering specimens next summer, as the plant is a biennial. Seeds were also secured so that a more showy plantation can be developed for the succeeding year.

JOHN K. SMALL.

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## THE LOSS OF A LARGE PALM

Record was made in the *Journal* for November 1903* of the transportation of a large palm, *Cocos plumosa*, measuring about 50 feet from its base to the tips of its leaves, from the greenhouse in Central Park, which it had then outgrown, to larger palm house at the Garden, where it was planted out as near the center as the steam-pipe tunnels would permit. This great palm has grown luxuriantly ever since, and during the past two years its crown of leaves has occupied the upper dome of the palm house, its length to the leaf-tips having reached over 80 feet, its trunk measuring 67 feet. Recently it has taken on the unfortunate habit of forcing a pane of glass out of the upper dome whenever it made a new leaf, and it being impracticable to lower it, we have been obliged to cut it down, very regretfully, for the tree has attracted the wonder and admiration of many thousands of people. The palm collection contains, however, several smaller plants of the same kind; it is a native of Brazil.

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## DR. PENNELL'S NEW POSITION

Dr. Francis W. Pennell has resigned from his position as an Associate Curator of the Garden to accept the post of Curator of Botany in the Academy of Natural Sciences of Philadelphia.

He has been with us for about seven years and has taken an important part in the scientific and educational work of the institution, additional to curatorial duties, including exploration, lecturing and monographic studies of American plants, especially

* Journ. N. Y. Bot. Gard. 4: 217. 1903.

those of the Figwort Family, on which he has become the best authority in the scientific world.

The Scientific Directors at their meeting on October 8th adopted the following preamble and resolution:

WHEREAS: The resignation of Dr. Francis W. Pennell as an Associate Curator has been tendered and accepted.

RESOLVED: That the Scientific Directors hereby record their appreciation of the services rendered the Garden by him during his work as a member of the staff and cordially wish him all success and enjoyment in his new position of usefulness.

N. L. BRITTON,
*Secretary*

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## NOTES, NEWS AND COMMENT

Letters received from Dr. Henry H. Rusby, Honorary Curator of the Economic Collections, who is leading a scientific expedition in Bolivia, (Mulford Biological Expedition) indicate success in the collection of botanical specimens. The latest news is dated August 30th, written from Huochi on the Bopi River, when recent work had included a trip up the Cochabamba River and all members of the expedition were reported to be in good health. Dr. Rusby gratefully acknowledges valuable aid received from the mining establishments directed by the Guggenheim Brothers on the eastern side of the Andes; one of his letters addressed to Mr. Henry Guggenheim on August 7th states that specimens of some five hundred plants had been collected up to that time, together with much information about geographic distribution and economic products, especially of drug-plants. Difficulties of many kinds had been encountered and overcome, but the loss of some valuable specimens by wetting in river rapids is mentioned. The party landed at Arequipa, Peru, about the middle of June and proceeded to La Paz, Bolivia, thence down the eastern Andean slopes, making botanical collections and observations at many points.

A heavy crop of fruit on the tulip-trees in the Garden this season is being utilized by the squirrels as a substitute for the chestnuts, which have disappeared under the attacks of the

chestnut canker. Many of the hickory trees, also, succumbed to the bark beetle, leaving very little natural food for the squirrels when the crop of acorns is light. These attractive little animals have thus been forced to acquire new habits and obtain their food from all sorts of unusual sources, including fleshy as well as dry fruits, buds, bark, and even the sugary sap of certain trees like the maples. At the present time the gray squirrel is almost the only one found in the Garden, but some fifteen years ago or more, the red squirrel was common. The black squirrel, merely a dark phase of the gray, is occasionally seen, the last one noted appearing about the boulder bridge quite recently.

Two interesting discoveries were recently made at Yama Farms by Dr. Murrill. The sweet-scented polypore, *Trametes suaveolens*, which is rather common on willow, was found on the large-toothed aspen, and on the same tree a splendid specimen of *Inonotus perplexus*, which latter specimen has caused considerable discussion because the type at Albany on which Peck based his description has been destroyed. The season about New York City has been unusually dry and very poor for fleshy fungi, but at Yama Farms, in the southern foothills of the Catskill Mountains, a number of species have been quite abundant. The sweet-scented species above referred to, which occurs occasionally in the Botanical Garden, has a fragrance much like that of anise seed, by which it can sometimes be detected several rods away.

A large specimen of *Roskovites granulatus*, measuring over three inches in breadth, was found recently under white pine trees east of Conservatory Range 1. This rather common, edible species of *Boletus* grows naturally under pines and other evergreens and seems to be following *Boletus luteus* in its method of introduction into our grounds. The two species are much alike, but *B. luteus* has an ample white ring, is much more slimy, and the surface is usually darker. It will be remembered that this species, *B. luteus*, which is also edible, appeared several years ago under the pines near Conservatory Range 1 and has since spread about the base of individual trees, especially on the northern side, until basketfuls of it may be collected after the autumn rains.

Professor F. S. Earle has returned to Porto Rico and is located at Central Aguirre, which is on the dry side of the island and not very good for fungi. He still finds a few specimens, however, which he shares with the Garden. Mrs. Earle is with him.

*Meteorology for September*: The total precipitation for the month was 3.35 inches. The maximum temperatures recorded for each week were as follows: *97° on the 2nd*, 88° on the 8th, 86° on the 13th, and 85° on the 23rd. The minimum temperatures were: 66°on the 5th, 55½° on the 9th, 52° on the 14th, and *49 on the 24th.*

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## ACCESSIONS

### LIBRARY, FROM MAY 1 TO SEP. 30, 1921

Albertson, Alice O. *Nantucket wild flowers, illustrated by Anne Hinchman.* New York, 1921. (Given by Dr. N. L. Britton.)

*Annales de I'Ecole nationelle d'agriculture de Montpellier.* N. S. Vol. 2 Montpellier, 1902 03.

Blatchley, Willis Stanley. *A naiure wooing at Ormond by the sea.* Indianapolis, 1902.

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*Bulletin of the Geological Society of America.* 30 vols. 1890–1920. Index, 3 vols. (Given by Dr. Arthur Hollick.)

Burnap, George. *Parks; their design, equipment and use.* Philadelphia, 1916.

Carnegie Institution of Washington. Publications 98, 112, 131, 139, 140, 178, 192, 194, 204, 206, 209, 217, 284, 289, 307. (Given by the Carnegie Institution of Washington.)

Castelli, Pietro. *Hortus messanensis.* Messanae, 1640.

Clementi, Mrs. Cecil. *Through British Guiana to the summit of Roraima.* London, 1920.

Deam, Charles Clemon. *Trees of Indiana.* 1st. Rev. ed. Fort Wayne, 1921. (Given by the author.)

*Der Pilz und Kreuterfreund.* 4 vols. Heilbronn a. N. 1917–21.

Gross, Alexander, ed. *The Daily Telegraph Victory atlas of the world.* London [1921].

Hartinger, Anton, & Becker, M. A. *Die essbaren und giftigen Schwamme in ihren wichtigsten Formen. Tafeln.* Ed. 2. Wien, 1870.

Hayes, Herbert Kendall, & Garber, Ralph John. *Breeding crop plants.* New York, 1921.

*Journal of the Washington Academy of Sciences.* Vol. 1–10. Washington, 1911–20.

*National geographic magazine.* Vols. 35–38. Washington, 1919, 20. (Given by Mrs. N. L. Britton.)

Patterson, Homer L. *Patterson's American educational directory.* Vol. 18. Chicago, 1921.

Pellett, Frank C. *American honey plants.* Hamilton (Ill.) 1920.

Printz, Henrik. *The vegetation of the Siberian-Mongolian frontiers* (*The Sayansk region*) Trondhjem, 1921. (Given by Det Kongelige Norske Videnskabers Selskab.)

Quin, John T. *The building of an island. . a sketch of the geological structure of St. Croix. . .* Christiansted, 1907. (Given by Dr. Arthur Hollick.)

Smith, Anne Lorrain. *A handbook of British lichens.* London, 1921. (Given by the Torrey Botanical Club.)

Taylor, Albert Davis, & Cooper, Gordon D. *The complete garden.* Garden City, 1921.

Thatcher, Roscoe Wilfred. *The chemistry of plant life.* New York, 1921.

Vivian, Alfred. *Everyday chemistry.* New York, 1920. (Given by the Torrey Botanical Club.)

Vries, Hugo de. *Opera e periodicis collata.* Vol. 5, 6. Utrecht, 1920.

Wiesner, Julius von. *Die Rohstoffe des Pflanzenreiches.* Ed. 3, Vol. 3. Edited by J. Moeller. Leipzig, 1921.

## Plants and Seeds

9 plants of Iris. (Given by Mr. Wm. Mohr.)

13 plants of Iris. (Given by The Elm City Nursery Co.)

14 plants of Iris. (Given by the Wing Seed Co.)

9 plants of Iris. (Given by Mr. Robert Peschko.)

5 plants of *Rhododendron catawbiense var. compactum.* (Given by Mr. H. P. Kelsey.)

30 plants of Iris. (Given by Movilla Gardens.)

47 plants of Iris. (Collected by Mr. W. Kimball.)

114 plants of Iris. (Given by Mrs. O. A. Runyon.)

264 plants for Fern Garden. (Purchased.)

8 plants of *Pentstemon procerus.* (Given by Mr. H. M. Schmoll.)

3 plants of *Dracaena indivisa.* (Given by Mr. H. M. Loeb.)

11 plants of *Hymenocallis.* (Given by Mr. A. Cuthbert.)

2 plants for Conservatories. (Given by Mr. P. A. Bruck.)

11 plants, all Cacti. (Collected by Mr. F. C. Rost.)

10 plants of *Artemisia Stelleriana.* (Collected by Miss Mary E. Eaton.)

25 Orchids. (Collected by Mr. P. H. Rolfs.)

50 plants of *Gaylussacia brachycera.* (Collected by Dr. J. K. Small.)

30 plants of *Oenothera argillicola.* (Collected by Dr. J. K. Small.)

74 plants, all cacti. (In exchange with the U. S. Nat. Museum, through Dr. J. N. Rose.)

. . . .

254 plants. (Derived from seed from various sources.)
2 packets of seed. (Collected by Mr. B. C. Tharp.)
4 packets of seed. (Given by Mr. James R. Pitcher.)
1 packet of seed of *Ipomoea sp.* (In exchange with Brother Hioram.)
1 packet of seed of *llysanthes attenuata.* (Collected by Dr. F. W. Pennell.)
3 packets of seed. (Collected by Dr. H. H. Rusby.)
177 packets of seed. (Purchased.)
109 packets of seed. (By exchange with B. G., Lyons, France.)
71 packets of seed. (By exchange with B. G., Glasnevin, Dublin, Ireland.)
79 packets of seed. (By exchange with B. G., Zurich, Switzerland.)
2 packets of seed from Trinidad. (Collected by Dr. N. L. Britton.)
4 packets of seed. (By exchange with U. S. Nat. Museum through Dr. J. N. Rose.)
1 plant for Conservatories. (Given by Mrs. A. Kegel.)
4 plants for Nurseries. (Given by Mr. John Dunbar.)
57 plants for Iris Garden. (Given by The Van Wert Iris Garden.)
31 plants for Iris Garden. (Given by Mr. B. H. Farr.)
6 plants for Iris Garden. (Given by Mrs. Martin A. Cumbler.)
56 plants for Iris Garden. (Given by Mr. Willis E. Fryer.)
10 plants for Conservatories. (Given by Mr. S. Rapp.)
237 plants for Nurseries. (Given by Mrs. C. D. Dickey.)
28 plants for Rock Garden. (Given by Mr. C. LeDuc.)
2 plants of *opuntia.* (Given by Mr. C. LeDuc.)
2 plants for Herbaceous Ground. (Given by Dr. E. T. Wherry.)
2 plants from Florida. (Collected By Mr. S. Rapp.)
26 plants for Conservatories. (By exchange with Prospect Park.)
4 plants for Conservatories. (By exchange with Mr. J. E. Haupt.)
6 plants of *Gleditsia* hybrid. (by exchange with Mr. Chas. C. Deam.)
11 plants for Conservatories. (By exchange with U. S. National Museum through Dr. J. N. Rose.)
298 plants derived from Seed.
1 pkt. of Seed. (Given by Mr. James R. Pitcher.)
23 pkts. of Seed. (Given by Mrs. Ethel A. S. Peckman.)

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# JOURNAL

OF

# The New York Botanical Garden

EDITOR

R. S. WILLIAMS

*Administrative Assistant*

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## BOTANICAL COLLECTING IN FRENCH GUIANA.

On the 10th of April this year I sailed from Port of Spain in the French mail steamer, St. Raphael, to undertake a three months' botanical exploration of any part of the Colony which I was to decide upon myself after arrival at Cayenne, the capital.

I arrived at Cayenne on April 15th (five days after I left Trinidad) and landed in rain. I had of course previously received sanction from the then Governor of Trinidad and Tobago, Sir John Chancellor, R. E., K. C. M. G., D. S. O., who had in turn obtained the authority of the Secretary of State for the British Colonies, London, England, to permit of my going, as this was special work outside the scope of the Department of Agriculture of Trinidad and Tobago to which I am attached as Assistant Botanist. And I desire to place on record that it was through the kindly recommendation of Mr. W. G. Freeman, Director, in the first instance, that I was able to obtain four months' leave for the purpose. Also to Mr. Wm. Nowell, who was Acting Director after Mr. Freeman had gone on vacation leave to England, I wish to express gratitude and appreciation for his good offices in the matter.

It was at the instance of Dr. N. L. Britton, Director-in-Chief of the New York Botanical Garden, that I was sent on this important errand to gather botanical specimens for the New York Botanical Garden, the United States National Herbarium, and the Gray Herbarium at Harvard University. When I got to Cayenne, after having had an opportunity to look around, I decided to make the capital my temporary home, as it was

noted that plants, of many families, were at hand both in the streets, on its walls, and in the canals which form no inconsiderable proportion of the areas which go to make up the town of Cayenne. The major portion of the land for miles outside of it consists of swamps, and numbers of persons dwell in houses built at the side of, and in some instances, right into the swamps themselves. In these places grow vast numbers of mangroves, especially *Avicennia nitida* and rushes of the genus *Eleocharis*. Hitherto few botanists have collected systematically in French Guiana, notably J. B. Patris in the year 1795, Aublet earlier during the same century and Lagot about 1855. Patris' plants went to Switzerland and Aublet's and Lagot's to Paris. Apart from these few collections little appears to be known of the botany of any part of French Guiana, hence Dr. Britton's anxiety to acquire some of the wild plants which grow in that fertile and interesting country for the three institutions referred to above.

After my arrival at Cayenne and due to complications of the customs regulations, I found that the French steamer St. Raphael by which I had come, had not landed my collecting outfit and baggage, but had over-carried the lot to Martinique. After a delay of a month, in consequence of the miscarriage, these goods and chattels were sent back to Cayenne by a French cargo boat. Here a problem presented itself and no alternative was left me but to seek for old newspapers to use as substitutes meanwhile for the driers that had gone to Martinique instead of being landed at Cayenne on April 15th. I managed with the help of the British Vice-Consul, Monsieur F. Rambaud, Mr. John Grosvenor of the British Consulate, and Monsieur Romney, of the Government Secretary's office, to accumulate a sufficient quantity of this class of paper and thus was able to begin botanical collecting without waiting until the proper papers were returned to Cayenne.

It rained throughout the period I was in French Guiana, which made my stay there run into four months instead of three, as originally intended, it being found impossible to return earlier owing to rains, steamer irregularities, and other unforeseen disadvantages. The drying of specimens in the midst of so much humidity was a difficult operation, especially with

soft-tissued plants such as the aroids. Mosquitoes were a terrible drawback, for they attacked me in hundreds and at times in thousands, seeming to come from all points of the compass, including in particular the ground upon which one had to stand or walk, as well as from the shrubs and trees that furnished a portion of the herbarium specimens. How to collect in the midst of such pests with a modicum of comfort, is a question well worth consideration for future action in those immense swamp districts. Perhaps I may be pardoned if I dwell on these enemies a moment so as to emphasize the painful ordeal a collector has to go through whilst engaged in his work in that part of the world. The worst of the mosquitoes is a big, black fellow known as "Mac," which darts at you deliberately and extracts blood immediately from bare arm, hand, head and even through clothing. I know something of mosquitoes, but the French Guiana ones beat anything I ever met in the West Indian Islands of Carriacou, Grenada, Tobago and Trinidad.

The Wet Season of French Guiana comes in at a time when it is the Dry Season of Trinidad and other islands of the Caribbean Sea, so that if one wishes to botanize when the weather is dry, the visitor would have to be there from July or August until December or January.

Due to the fact that I had received directions from Dr. Britton to limit the area for field work and to pick up everything I came across, weed or otherwise, which might be in flower or fruit, Cayenne, as stated above, was made my headquarters. My duty therefore was to overlook nothing that came in my way, either as street weeds or trees of the country, or its mosses, fungi, vines or shrubs; hence I was not restricted to special groups, or species, that were indigenous in the districts where I was occupied in plant-study and plant collecting. I should like to repeat that Cayenne is a town of swamps that extend for miles to the eastward. Long before you enter the harbor you pass millions of mangrove trees with no sign of sandy sea shores. Mud everywhere! Upon landing and after inspecting the trees in and out of town, I observed with surprise the total absence of wild pines (Bromeliaceae), not an individual appearing on a single tree.

True, I met a few clumps of the long-leaved terrestrial species (*Nidularium Karatas*) on Matabon hill, but these were neither flowering nor fruiting: that was the only representative of the family which was seen by me. This is a fact not easily explained, because unusually large aerial masses of orchids of the genus *Epidendrum* (not in flower but possibly the common *E. fragrans* and *E. ciliare*) had become attached to bare trunks of cabbage palms. *Epidendrum stenopetalum*, which was blossoming freely and had bigger flowers than the Trinidad form, and *Epidendrum strobiliferum* were common on mango trees about Cayenne, as also *Polypodium incanum*, a well-known tree-loving fern. I saw one other orchid on trees in sparing quantities but that was not flowering, the leaves were terete and suggested small plants of *Oncidium Ceboletta*, and yet I feel convinced it was not that plant. The orchid flora is exceedingly poor, either in terrestrial or epiphytal species, in the vicinity of Cayenne. Plants of other groups are strong, whether they be on walls or in the ground, large shrubs being a common feature on the sides and tops of masonry structures. Then, why should Bromeliaceae be absent?

A few of the more prominent plants of the town and its immediate environment are *Solanum torvum*, *Jatropha urens*, *Lantana Camara*, *Eleusine indica*, *Tragia volubilis* (climbing stinging nettle), *Piper marginatum*, *Leucaena glauca* and *Mimosa pigra*. The swamps of course have their own vegetation, the more conspicuous being sedges and innumerable mangroves. Just outside the limits of Cayenne the land takes on the character of natural savannahs which are unsuited for agricultural purposes. Half a mile along the St. Madeleine Road begin savannah stretches which support such plants as sedges, grasses, *Adiantum*, *Mabea*, *Hirtella*, *Inga*, *Annona*, *Psidium*, *Euphorbia*, *Canavalia*, *Maximiliana*, Melastomaceae and Rubiaceae. In the swamps farther out on the same road are mangroves and the tall, massive "bally-hoo" (*Ravenala guianensis*). This is the principal place where the refuse of Cayenne is daily deposited, being brought hither by special carts driven by convicts, causing, in consequence, this part of the country to have an atmosphere of extreme unpleasantness to the collector, although the residents admit they do not notice it, as they are "used to it." It was

here, aggravated by mosquito attacks and rains, that much of my collecting had to be done. And it was here that the blossoming, shrubby Melastomaceae were so grand a sight that it made one forget everything else, while admiring their beauty and floriferousness. Beyond in the swamps, quantities of the tall *Thalia geniculata* were in full vigor and blossom, and it was near there where a few plants of the tall grass *Chaetochloa Poiretiana* were seen and nowhere else. The main roads are suited to car driving and by this means distances can be traversed over that portion of French Guiana which forms the island of Cayenne and upon which the capital, bearing the same name is included. "Mango" and Badouel are sandy parts of the country situated in proximity to the town, designated by botanists and naturalists as savannah areas; poor lands unsuited generally for supporting useful plants, either for industrial or food purposes. Large, old mango trees are numerous and the presence of these fruit-trees gave the name of "Mango" to the place in the first instance, I was informed. Many plants of interest are found hereabouts, *Isertia*, grasses, Scrophulariaceae and Apocynaceae, attracting first attention. In the adjacent districts some low hills, two to three hundred feet high, come into prominence and upon these elevated lands grow forest trees which throw dense shade to the ground below. I had an opportunity of botanizing upon three of them, (a) Matabon hill, where a reservoir is to be seen, (b) the hill above Grant's road and (c) another hill close to a rum distillery, parts of each of the three being washed by the open sea. The vegetation is thick and is composed of trees, shrubs, large vines and ferns, representing but a few species, one or two Scitamineae, some grasses and a few sedges.

One terrestrial orchid was collected; it had a solitary fruit, was about two feet tall and this was the only ground orchid I saw throughout my four months' visit. No *Leiphaimos* (*Voyria*) was observed, notwithstanding the ideal conditions found on these forest-clad hills for the growth of such plants. Two things may perhaps be signalled out for special notice just at this point, my number 799 (*Helosis* sp.) which had for its home a place under dense shade at Matabon, and a climbing aroid whose shining green leaves and pink-colored shaggy

petioles were exceptionally pretty. On the hill above Grant's Road to which I frequently went and among the arborescent flora grew trees with round green fruits looking not unlike a West African rubber-producing *Landolphia*. The fruits were found to contain a great deal of white sap which was of a tenacious stickiness, and from all parts of the tree, when freshly cut, flowed this colored sap. Herbarium specimens, while drying, had a rather pleasant smell and the cut portions turned dark brown.

In Cayenne there are two public avenues, one formed of full-grown mango trees where boys and men stone the trees unmercifully during the time they are fruiting, and the other running up past the cemetery and turning off towards Badouel and the so-called Botanic Garden. This avenue has been formed of locust (*Hymenaea*) with a sprinkling of *Carapa guianensis*, the "crappo tree" of Trinidad. The small area called the "Botanic Garden" is full of bush and weed; boys and men shoot the few wild birds unhindered, there being no license for firearms and no check by the authorities to the killing of those of utility and beauty. Freedom of action in this respect would seem to exist in and out of Cayenne.

French Guiana is a magnificent fruit country. Its bananas, oranges, mangoes and plantains are of the best, not only in size but in quality as well. The lime trees (*Citrus*) are healthy and free of wither-tip and other pernicious diseases. Small sugar-cane fields were looking in healthy condition, but agricultural matters in that part of the Guianas are backward. So far as could be ascertained, the cultivating of canes is primarily for the purpose of producing the favorite drink of the place, known as taffia there and rum elsewhere. The three chief industries of French Guiana, apart from rum-making, are gold-digging first, followed by Balata-tree bleeding for gum and the making of a liquid essence from a timber tree known as "bois rose." At the time of my visit these industries were not thriving, many people being out of work as the result of employers closing down their respective business places, yet that made no difference in the high cost of food and clothing at Cayenne.

The principal water supply of the town comes from a considerable distance, where the wild vegetation is fairly luxuriant,

but I had only one opportunity of seeing it, and that was the day before I left Cayenne on August 1st; it was there I saw a large Cannon-ball tree (*Couroupita*). In one of the swamps there was growing and flowering a tall grass with green inflorescence which hung from the tips of the culms. Unfortunately the water was too deep and the time too limited to allow of my collecting specimens. A *Montrichardia* was also seen which matched well with the Trinidad *M. aculeata*. Scarcely a butterfly or other large insect was seen either on this or any other day and birds appeared scarce.

During the time I was at Cayenne I saw neither moth nor allied insect attracted to the electric lights at night. These blanks in the fauna puzzled me as much as did the absence of the tree-loving Bromeliaceae. Mud, mire and unpleasant odors usually confronted one, so that it was refreshing to see a piece of sandy sea shore as that which skirts the end of Grant's road, Matabon. It was there that "drift seeds" were picked up among swarms of biting sand flies; off the beach, islets stand in view and upon one of the smaller ones upright growing cactuses were seen.

In closing this narrative I must not omit to refer to the kindness rendered me by His Excellency, the Governor of French Guiana; Monsieur Romney of the Chief Government Secretary's Office; Monsieur Magney, Agent of the French Line of Steamers; Monsieur F. Rambaud, the British Vice-Consul; and Mr. John Grosvenor of the British Consulate. I also received courtesies and civilities from every government official and private resident I met.

The two chief fodder grasses cultivated at Cayenne are Pará grass and rice grass (*Chaetochloa* sp.) Guiana grass seems to be unknown. Palms furnish large lots of fruits that are bought up readily in the market as food items in their season.

The town of Cayenne has wide streets, good residences, a splendid water supply for drinking purposes and a daily ice out-put. At night electric lights are seen throughout the place. Due to easterly winds the air is cool and pleasant even at midday in the shade.

In their entirety my collections were shipped to Dr. Britton from Port of Spain to New York. One other item ought to be added and that is the rare occurrence of a two-trunk cabbage-palm some sixty feet in height among the rest of the Oreodoxas outside the Hospital of St. Paul.

W. E. Broadway

# HOW TO GROW RHODODENDRONS.[1]

Rhododendrons can be grown much more easily in the greater part of Southeastern New York, than in any part of Western New York, as lime is present in the soil throughout the most of Western New York. By Western New York I refer more particularly to the region around Rochester, Batavia and Buffalo. In most instances where success has been obtained in Western New York in the growing of Rhododendrons the soil has been excavated to a depth of several feet and replaced with humus. This of course is an expensive operation.

During the past thirty years collections of Rhododendrons were more or less severely injured throughout the greater part of the Northeastern States by the severely cold winters of 1903 and 1904, 1917 and 1918, and 1919 and 1920, causing a vast amount of injury in the burning of the foliage, half-killing many, and killing large numbers out-right. Many growers were much discouraged because a number of those forms that were considered hardy were in many instances severely injured or killed. Azalea species, and numerous hybrids, suffered comparatively very little, and presented a good display of flowers, and only a limited number of their flower buds were blasted with the intense cold.

The so-called Catawbiense hybrid Rhododendrons, in a somewhat limited number, which are familiar in many gardens, and a few American, Caucasian and Asiatic species are the only forms that have been at all successful in cultivation in the Northeastern States, and we do not think their cultivation should be abandoned on account of a few "set backs". The origin of these Catawbiense hybrids is more or less obscure and involved, but whatever hardihood they have is surely due to the presence of the blood of our native *R. catawbiense.* Very few named forms have been added to these hardy Catawbiense hybrids recently.

A number of hybrids of reputed hardihood have resulted from the introduction of the blood of *R. caucasicum* with other forms. Boule de Neige is the only one of these we have had experience with. It is a compact plant with white flowers, very hardy, and a beautiful form.

[1] Public lecture at the New York Botanical Garden, September 3, 1921.

The Caucasian *R. Smirnowii* has been crossed with *R. catawbiense* at the Arnold Arboretum, and the progeny is said to be quite hardy, The flowers vary from clear pink to deep rose. In this there is excellent promise of a race of important garden plants. *R. Smirnowii*, in its typical form, is a handsome flowering plant but it needs considerable shade.

*R. carolinianum* is a very decorative garden plant, of small compact habit, with flowers varying from pale rosy-purple to almost white, and has a good, hardy constitution. It is a most desirable plant for gardens and parks, and fortunately is now being offered in large quantities by some American nurserymen.

*R. ferrugineum*, *R. hirsutum* and *R. myrtifolium* on account of their low compact habits are excellent garden plants. Their flowers are pretty, but not conspicuous. It is true that with us their leaves are occasionally somewhat scorched by sun and wind in late winter, but they soon recover with their new growths.

*Rhododendron mucronulatum* is about the earliest flowering form with us. It has an upright-growing habit. The flowers are rose-colored with a tinge of lilac, and it blooms from the end of March to April 1st. The blossoms are sometimes injured by severe spring freezing.

It is to be regretted that the large number of new species discovered by Henry E. Wilson in Western China will not thrive in any part of the Northeastern States. They do well on some parts of the Pacific Coast and in Great Britain and Ireland.

Some botanists now place what we all know as Azaleas, with the deciduous leaves, generically under *Rhododendron*. Azaleas appear externally to be so different from Rhododendrons that it is difficult for gardeners to become accustomed to calling them Rhododendrons. In an extraordinary wealth of varied rich colors, the hardy species and hybrid Azaleas cannot be excelled by any shrubby garden plants. The late George H. Ellwanger said of Azaleas in the "Garden's Story," "The soft tints of buff, sulphur and primrose, the dazzling shades of apricot, salmon, orange and vermilion, are always a fresh revelation of color. They have no parallel amongst flowers, and exist only in opals, sunset skies and the flush of autumn woods." This may appear exaggerated, but when a large collection of the so-called Ghent hybrids, and different species of Azaleas are assembled together

in a ravine, and well established plants are in full bloom, Mr. Ellwanger's description is not overdrawn.

The American Azaleas are lovely flowering plants, and should be extensively planted. Seventeen species are now credited to North America. Eight of these are more or less in cultivation. Perhaps one of the most beautiful is *Rhododendron calendulaceum* distributed freely on the Appalachian range. The flowers vary from light yellow to deep orange-scarlet and the plant flowers freely when two and one half to three feet in height.

The status of a beautiful native Azalea has recently been brought to light, and it is now known as *Rhododendron roseum*. This plant has formerly been known as *Azalea nudiflora*. It is native throughout the greater part of New York State and far beyond. It is a common plant in the lime-stone regions of Western New York. In fact I have found it growing on Onondago limestone rocks with only a few inches of soil and the roots literally adhering to the disintegrated limestone. The flowers vary from light pink to deep rosy pink, and are deliciously fragrant. We have in this Azalea a garden plant of much beauty and hardihood, and adapted to a wide range of soil conditions. It should be raised and distributed in tens of thousands.

*R. nudiflorum* is now known to have a much more southern distribution than *R. roseum*, and is a rare plant in Western New York, but seems to be quite well distributed in the eastern part of the State. The showy pink flowers are very attractive, but have very little fragrance.

The other species of American Azaleas are important in the order following: *R. Vaseyi*, *R. arborescens*, *R. occidentale*, *R. canadense* and *R. viscosum*.

Of the thirty-four species of Azaleas credited to the Old World in Wilson & Rehder's monograph of Azaleas perhaps not more than ten or twelve species are hardy, outside, as far north as New York State. One of the most hardy and beautiful is *R. japonicum*. The flowers range in color from orange-red to almost red. This was for a long time confused with the more tender *R. molle*. The latter has handsome yellow flowers, but has not the enduring qualities of *R. japonicum*. The handsome hybrid race known as *R. Kosterianum*, in numerous forms, is the result of crossing *R. japonicum* with *R. molle*.

*Rhododendron Schlippenbachii* promises to become an important garden plant. It is said to be a common shrub in Korea and particularly abundant on the Diamond Mountains. It has a very distinct appearance and can easily be recognized from any other Azalea. It flowered with us last spring for the first time. The large blossoms are clear pink and are quite showy.

Kaempfer's Azalea, now known botanically as *Rhododendron obtusum* var. *Kaempferi*, is a most desirable and beautiful garden plant. Introduced from Japan about thirty years since, it is now fairly well distributed. The flowers usually vary from light red to deep red. It seems to enjoy partial shade, and in the Arnold Arboretum does splendidly under the partial shade of hemlocks, showing a much richer coloring than where it is exposed to the full sun.

The dainty and lovely Kurume Azaleas recently introduced to American gardens from Japan, which reveal a wide range of exquisite shades, are now attracting a great deal of attention and may, perhaps, prove to be hardy in Long Island and southward, outside, as well as in sheltered places around New York. I do not think they would be at all satisfactory in Western New York out of doors.

Amongst the various groups of hardy hybrid Azaleas the so-called Ghent Azaleas are the most desirable. The flowers are, perhaps, not as large as in some of the other hybrid groups, but the tinting is exquiste, and most of them are fragrant.

Somewhere about 1825 a baker at Ghent hybridized some of the American Azaleas amongst themselves, and also with the Pontic Azalea, now known as *Rhododendron luteum*. About the same time similar work was done in England; in all, many hundreds of named forms were produced. Later the Japanese and Chinese Azaleas were hybridized amongst themselves, and with other hybrid groups, in which also the beautiful Pacific coast *Azalea occidentalis* was involved until "the parentage of most of these forms is so mixed that it is impossible to recognise their origin with certainity."

The forms of the Ghent hybrids are perhaps more enduring than the individuals of the other hybrid groups, and some of the best are Gloria Mundi, Altaclarensis, Unique, Cardinal, Daviesei, Viscocephala, Pallas, Fritz Quihoui, General Trauff, Grandeur

Triumphante, Ignea Nova, Joseph N. Bauman, Julda Schipp, Madame Moser and Pucella.

As already intimated the soil in Highland Park, Rochester, contains lime. The subsoil is light, sandy loam, on gravel, and well drained naturally. This soil was excavated to a depth of two and a half to three feet and replaced with humus which was found conviently near in a "Kettle-hole," with which cow dung was liberally mixed. All attempts to grow Azaleas previously, without this preparation, were absolute failures. The plants are well protected from the sweep of the north-west and north winds by sloping banks, and additional planting of evergreens on the east and west sides, adds to the protection. No over-head covering is attempted in winter. Late in the autumn the entire area is heavily mulched with leaves to a depth of eight or nine inches, which are allowed to remain throughout the year, and this is repeated annually. Extreme watchfulness must be exercised in preventing the humus from becoming dry, because if this is permitted, it is extremely difficult to restore it to the point of saturation, and the plants will suffer and pass through the winter badly.

I might say here that in Durand-Eastman Park, ten miles north of the city of Rochester, on Lake Ontario, and north of what is known as the "Ridge Road" the soil contains only a faint trace of lime, and we have found to our great satisfaction that the American Azaleas and Rhododendrons do remarkably well in the light sandy soil, without more than a surface mulching of leaves or decayed manure. It is only during the past few years this fact has been known.

In regions where Rhododendrons and Azaleas will thrive, where no lime is present in the soil, it is an entirely unnecessary expense to excavate and replace with soil of a peaty nature, as I know is sometimes done. If the soil is a light sandy loam and well drained, all that is necessary is to trench it to a depth of two and a half to three feet, and incorporate a liberal amount of humus and cow dung in the surface and Rhododendrons will be happy. Protection from the sweep of the cold northwest and north winds, which are so sear and penetrating in February and first of March, is essential by the lay of the land or by some other means. If tall trees are adjacent to break a little of the winter

sunshine it may help them considerably. I believe however if they are thoroughly mulched, and the roots are in the right status of moisture, winter sunshine has but little effect on them.

The propagation of Rhododendrons and Azaleas is now a very important matter in this country since the government prohibited the importation of any plants with balls of earth.

Rhododendrons are not difficult to raise from seeds and our experience in raising seedlings from the best colored Catawbiense hybrids has been most gratifying. We have raised a number of forms that in our opinion are about as good as the named forms. Very fine pink and lavender-pink shades have been obtained. We have one clear pink form that flowers ahead of any of the named Catawbiense hybrids. We strongly urge the raising of seedlings from these Catawbiense hybrids, particularly where a large collection is assembled, as no doubt cross pollination is effected naturally. They will flower in from five to six years from seed.

It is hoped that American nuserymen wherever they have the opportunity, will propogate Rhododendrons and Azaleas extensively, and I do not see any reason why the typical *R. catawbiense* cannot be used as a stock for Rhododendrons instead of *R. ponticum*. We have used *R. catawbiense* in a limited quantity and so far it appears to be satisfactory. *R. ponticum* is the common stock for grafting Rhododendrons on the continent of Europe. It is known to be tender and we believe for cold regions that *R. catawbiens* would be better suited. Stocks should be potted in spring. By autumn they will be well rooted. Move them from a cold frame into the greenhouse in mid-winter, and after they are well rooted, the cions can be united towards the base by side or veneer grafting, and tied with strong cotton. The cutting back of the stock should be done very gradually after the union has been thoroughly established. Some propagators do not head the stocks back entirely until the following year.

Seeds of either Rhododendrons or Azaleas should be sown in the greenhouse as soon as ripe, in small flats or pans, well drained, on a finely prepared surface of sandy, peaty soil. They should be kept close to the glass and shaded from direct sunshine until they are well germinated. Care must be exercised not to over-

water or they will damp readily, particularly in dull winter weather. By spring they will be large enough to transplant to other well drained flats or pans. It is a good plan to keep these pans or flats in lightly shaded frames throughout the summer. In late summer or early autumn they will be ready to shift into two or two and one half inch pots and carried throughout the winter in a cool greenhouse temperature. The following spring they can be transplanted from the pots into nursery beds.

JOHN DUNBAR,
*Rochester, New York.*

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## NOTES, NEWS AND COMMENT

The flowering of the dahlia border was brought to an abrupt close by killing frosts on the mornings of October 26 and 27. The advent of the first killing frost was the earliest in the four years of the border's existence. In 1918 it was killed on November 7; in 1919, on November 10; and in 1920, on November 13. The faint hope that an annual increment of three days in the length of the season was being established was doomed to disappointment. On account of the light rainfall of the summer and autumn, the plants were less luxuriant and the flowers less profuse than in the more copiously watered seasons of 1919 and 1920. The exhibit, however, included many new and superior varieties and the border, as in the three previous years, attracted much attention and did much to keep the people of New York and vicinity in touch with the latest perfections in dahlia-breeding. The beautiful novelties contributed by Judge Josiah T. Marean of Green's Farms, Conn., and by J. J. Broomall of Eagle Rock, California, were especially noteworthy.

Miss Sophie Satin, a mycologist and former member of the University of Moscow, but at present residing in New York, has recently paid a number of visits to the Botanical Garden Museum for the purpose of looking over our mycological collections.

*Meteorology for October*:—The total precipitation for the month was 0.58 inch. The maximum temperatures recorded for each

week were as follows: 75° on the 7th, *78½° on the 11th*, 76° on the 19th and 66° on the 28th. The minimum temperatures were: 37° on the 9th, 36° on the 13th, 35° on the 24th and *28° on the 27th*. The first killing frost of the autumn was on the morning of the 26th, when a temperature of 29½° was recorded.

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# ACCESSIONS

## Museum and Herbarium

1 specimen of *Cepaluros virescens* from Mississippi. (Given by Professor L. E. Mills.)

50 specimens of marine algae from Bermuda. (Given by Dr. A. B. Hervey.)

26 specimens of flowering plants from the Bolivian Andes. (By exchange with Harvard University.)

1279 specimens of flowering plants from Haiti. (By exchange with the United States National Museum.)

105 specimens of flowering plants from Utah. (By exchange with Professor A. O. Garrett).

121 specimens of flowering plants from Arizona. (Distributed by Mr. W. N. Clute.)

5 specimens of flowering plants from southern Utah. (Given by Dr. Harry Hapeman.)

1 specimen of *Osmunda claytoniana* from Vermont. (Given by Mrs. W. E. Mack.)

48 photographs of plants, mostly cacti. (By exchange with the United States National Museum.)

1 lantern slide. (By exchange with the Brooklyn Botanic Garden.)

11 specimens of flowering plants. (By exchange with the Royal Botanic Gardens, Kew, England.)

49 specimens of flowering plants from the Peruvian Andes. (By exchange with Harvard University.)

10 specimens of hepaticae from New England. (Given by Miss Annie Lorenz.)

3 specimens of orchids from eastern North America. (Given by Dr. H. M. Denslow.)

36 specimens of flowering plants from South America. (By exchange with Harvard University.)

30 photographs of cacti. (By exchange with the United States National Museum.)

53 specimens of mosses from Trinidad. (Collected by Mrs. N. L. Britton.)

56 specimens of mosses from Hawaii. (By exchange with Rev. David Lillie.)

178 specimens of mosses from Georgia, Alabama, Florida, Missouri, Colo-

rado, Utah, Alaska, Guatemala, Panama, Venezuela, and Africa. (By exchange with the United States National Museum.)

678 specimens of mosses from Michigan. (By exchange with Dr. George E. Nichols.)

32 specimens of mosses from California and Montana. (By exchange with Miss Alice Eastwood.)

12 specimens of mosses from British Guiana, Maine, and Vermont. (By exchange with Professor Edward B. Chamberlain.)

4 specimens of mosses from Portugal and Madeira. (By exchange with Professor T. D. A. Cockerell.)

1 specimen of moss from California. (By exchange with Miss Dorothy Coker.)

37 specimens of mosses from Java. (By exchange with Dr. A. W. Evans.)

60 specimens of mosses from various localities. (By exchange with Professor J. M. Holzinger.)

865 specimens of flowering plants from North America. (By exchange with the United States National Museum.)

4 specimens of flowering plants from Alabama. (Given by Dr. R. M. Harper.)

1791 specimens of Brazilian plants. (By exchange with the British Museum.)

1 specimen of *Poria* from New York. (By exchange with Dr. H. D. House.)

1 specimen of *Stropharia ambiguum* from California. (By exchange with Alice Eastwood.)

25 specimens of fungi from Porto Rico. (By exchange with Professor F. S. Earle.)

3 specimens of fungi from Albertia, Canada. (By exchange with Mr. N. B. Sanson.)

12 specimens of fungi from Bermuda. (By exchange with Dr. H. H. Whetzel.)

3 polypores from Brazil. (By exchange with Mr. H. M. Curran.)

6000 specimens of flowering and flowerless plants from Trinidad. (Collected by Dr. and Mrs. N. L. Britton.)

625 specimens of ferns and fern-allies from Jamaica. (Collected by Mr. W. R. Maxon.)

164 specimens of flowering plants from Guatemala. (By exchange with Professor W. W. Rowlee.)

250 specimens of flowering plants from Jamaica. (By exchange with the Royal Botanic Gardens, Kew, England.)

23 specimens and photographs of cacti. (By exchange with the United States National Museum.)

1 specimen of *Sonchus uliginosus* from Pennsylvania. (Given by Mr. E. A. Rau.)

18 specimens of mosses from Santo Domingo. (By exchange with the United States National Museum.)

478 specimens of flowering plants from Martha's Vineyard. (By exchange with Harvard University.)

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OF

# The New York Botanical Garden

EDITOR

R. S. WILLIAMS

*Administrative Assistant*

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In the Deering hammock, Cutler. Large tables of oolitic limestone, right and left, in foreground; pond-apple (*Annona*) trees, hosts of numerous air-plants—orchids and wild-pines, in background. The rim at the top of the tables indicates the maximum normal water-table. Originally a uniform layer of limestone of varying consistency was present. The softer parts were eroded mainly by the fluctuating seasonal water-table; the harder parts resisted erosion, hence the cañons and grottoes on the one hand and the tables on the other. The tables support trees just as large as those on the floor of the hammock.

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# HISTORIC TRAILS, BY LAND AND BY WATER.

## A RECORD OF EXPLORATION IN FLORIDA IN DECEMBER 1919.

WITH PLATES 263-266

The prospect of passing, within the space of a few hours, from the dead of winter into the life of summer is naturally fascinating. With this outlook in mind Dr. and Mrs. Britton, Mrs. Small, and the writer left New York en route for Florida about the first of December, 1919.

Repeated killing frosts and freezing weather about New York had ravaged all growing things, except the evergreens, at least in exposed places.

The striking objects in the landscape in emerging from the Hudson River tunnel into New Jersey were the dead stalks and leaves of cat-tails (*Typha*) and those of the common-reed (*Phragmites*). Both of these plants, even the same species, occur as far south on our eastern seaboard as the Everglade Keys and Florida Keys, where they are not only evergreen, but may often be found in flower or in fruit nearly throughout the year.

North of the Mason and Dixon line the hardwood trees were leafless, except in the swamps of New Jersey where the young pin-oaks (*Quercus palustris*), not the old ones, still held their dead, dried leaves. The characteristic bark, clothing the trunk of the white-birch (*Betula populifolia*), was a prominent feature in the landscape of the rocky slopes below New Brunswick, while the smooth-alder (*Alnus serrulata*), in the low places, showed its nascent aments ready to flower with the first real

warm spell of the winter. The only green that appeared on the ground was that of the foliage of the winter-annual weeds growing in hedges and in other sheltered places.

In Virginia and North Carolina some green foliage appeared on two or three cultivated shrubs, the Japanese-honeysuckle (*Nintooa japonica*)—often an escape—and privets (*Ligustrum ovalifolium* and *L. amurense*)—usually in hedges—and on one native tree, the sweet-bay (*Magnolia virginiana*), which was especially conspicuous among the other trees on account of its persistent leaves. In addition, a parasitic woody plant, the mistletoe (*Phoradendron flavescens*), furnished greeneries varying from the size of one's head to that of a bushel-basket. It was most abundant on oaks, hickories, and gums.

On barren hills the scrub oaks, and in other places, larger oaks, still held their dead and dried leaves, all of which stood out in strong contrast against scattered groves of the evergreen red-cedar (*Sabina virginiana*).

However, from Virginia to Georgia leaves other than dead ones were in evidence in low places and in swamps; but they were not green. The tulip-tree (*Liriodendron*), the maple (*Acer*), the sweet-gum (*Liquidambar*), and the sour-gum (*Nyssa*) were all brilliant with various shades of yellow and red foliage. Some deciduous-leaved oaks also showed well-colored leaves. Further south, however, one kind of oak was green. It was the live-oak (*Quercus virginiana*) and looked just the same as the live-oak trees in southern Florida. Latitude has little or no effect on the appearance of this tree. Growing with it, occasionally, was the red-mulberry (*Morus rubra*) which was just about devoid of leaves. This tree represents another case in which latitude does not seem to affect the habit of the tree to any appreciable extent. However, instead of being evergreen like the live oak, the mulberry drops its leaves in fall or winter throughout its range, whether it be in Canada or in southern Florida

In southern Georgia the trees in the hammocks of the swamps and along the streams had not put on their fall coloring, at least not to the same extent as those further north.

The extensive marshes, naturally, appeared approximately as they do the year around. Two plants, however, were particularly conspicuous on the flats about the winding channels,

strongly contrasted by different shades of color—the one a dark-green rush (*Juncus*), the other a light-green grass (*Spartina*). Moreover, evidences of the cultivated crops of the Georgia lowlands were not wanting, for numerous bright green plants of asparagus were scattered along the railroad, and the dull-yellow stubbles of the rice fields often attracted the eye.

Ditches along the way, filled with a shimmering gold, disclosed the only conspicuous flowering plant then in full bloom. It was a species of bur-marigold (*Bidens*). Blooming as it did in what is to be considered about mid-winter in that latitude, it is hard to decide whether the plant was a belated fall-bloomer or an early spring-bloomer. Associated with the bur-marigold was a very tall, woolly beard-grass (*Erianthus*) with stems six to twelve feet high, terminating in long, silvery, fruiting plumes which, of course, stood far above all the surrounding herbaceous vegetation.

Along the Saint Johns River at Jacksonville more plants were in flower. In a small area there were observed—beard-grass (*Andropogon glomeratus*), water-hyacinth (*Piaropus crassipes*), Indian-shot (*Canna flaccida*), bladder-pod (*Glottidium vesicarium*), aster (*Aster lateriflorus*), groundsel-bush (*Baccharis halimifolia*), and beggar's-ticks (*Bidens leucantha*). There, too, a cultivated tree, the common pear (*Pyrus communis*) and the native tooth-ache-tree or prickly-ash (*Zanthoxylum Clava-Herculis*) were in bloom.

While in the field our collecting headquarters were maintained at the laboratory building of the Plant Introduction Garden of the United States Department of Agriculture, through the courtesy of Dr. David Fairchild. Our field work was made possible by the generous cooperation of Mr. Charles Deering. Mr. Deering's cactus plantation at Buena Vista, moreover, still served as the basis for our studies in the cacti of the eastern United States.

Florida appears to be peculiar among the States in one respect, at least—towns in all parts of that Commonwealth claiming to have "the best location and the best climate."

Notwithstanding this advertised uniformity in place and climate, there is really great diversity in the climate and consequently in the vegetation. The latter, of course, was the magnet that attracted us to the field. Palms and wild-pepper

plants were our chief object of search. It was also planned to visit hitherto unexplored points in the southern end of the peninsula.

Mention of a few makers of the early Florida trails may be of interest—among others, prehistoric aborigines; Seminole Indians; adventurers, as de Soto and de Leon; buccaneers, as Black Caesar and Gilbert; shipwrecked refugees, as Dickenson and associates; naturalists, as the Bartrams and Baldwin; land improvement agents, as Turnbull and Perrine; Indian hunters, as Canova and Taylor. Their activities have added greatly to the fascination of subsequent exploration.

Four different historic trails served us in accomplishing the major portions of our field work:

*First*, the old trail along the eastern coast, from Saint Augustine southward. Parts of this, or what they developed into, date back several centuries. Of late this trail has been transformed into the southern part of the Dixie Highway.

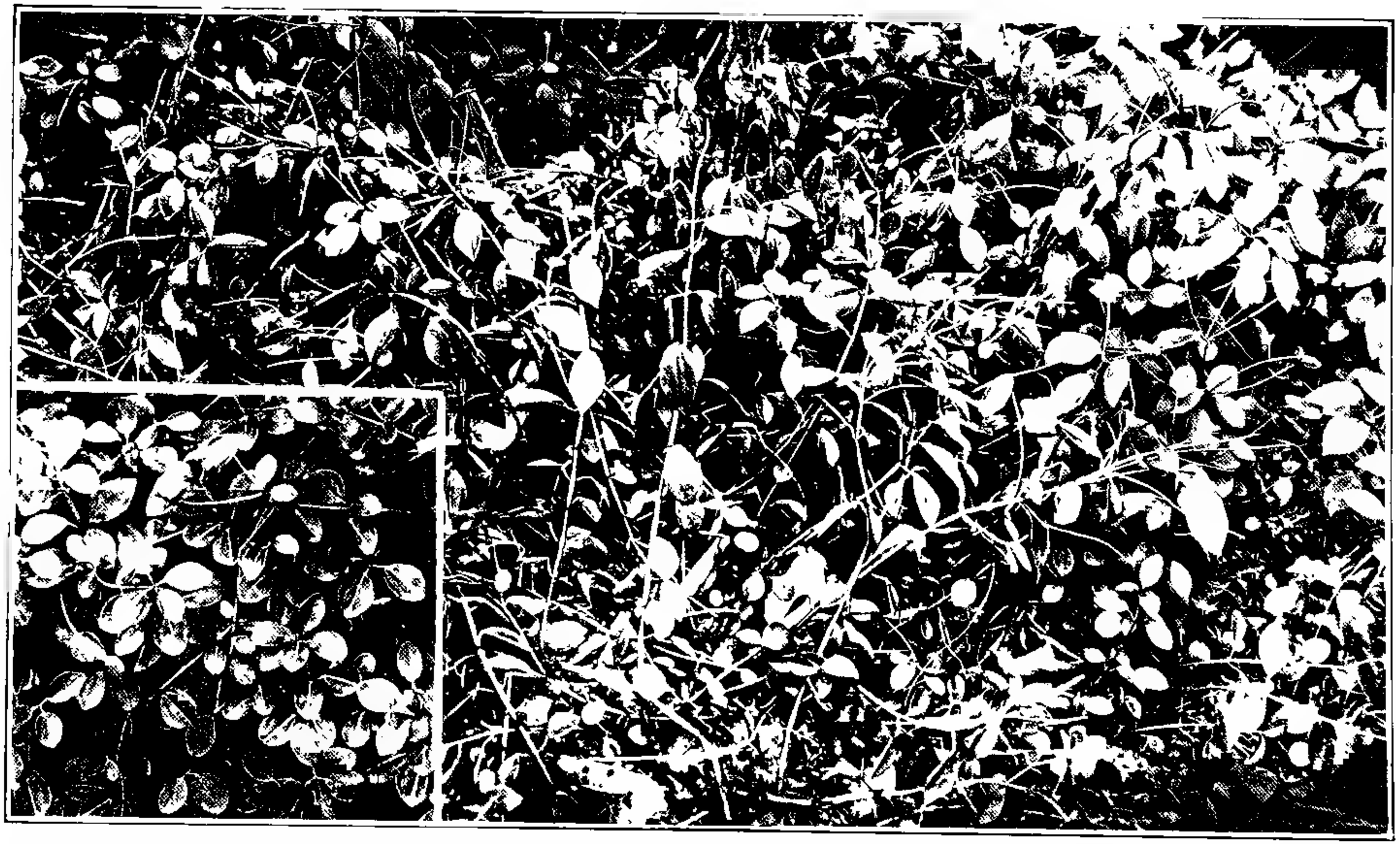
*Second*, the trail made by the surveyors of past and present generations, in opening up the territory between Miami and Cape Sable. Within the past few years this has been transformed into the Ingraham Highway.

*Third*, the Fort Bassenger trail, which dates from the Seminole War times. The part in Hungry Land is being improved, that in the Allapattah Flats is in about the same condition it was a century ago. It connected the eastern coast from the vicinity of Jupiter with the Okeechobee region and lower Kissimmee River region, terminating at Fort Bassenger, which was situated on the Kissimmee River about fifteen miles, in a straight line from the northern end of Lake Okeechobee.

*Fourth*, the so-called inside course on the Florida Reef between points on the lower eastern coast and Key West. The use of this course dates back many years. A history of the craft and personage that traversed it for generations before the power-boat was invented would make interesting reading. Like the trails referred to above, it has been improved in recent years, chiefly by dredging and staking channels.

We left the train at Daytona and proceeded down the eastern coast, by motor-car, to Miami.

Daytona is situated in the remains of a once great hammock. The two most prominent trees still standing in the streets and



Floor of hammock on ancient sand-dune bordering Saint Lucie Sound. Tropical trees comprise this hammock. On the hammock floor grows a typically West Indian wild-pepper (*Peperomia humilis*), shown above. It is sometimes nearly as luxuriant here as it is in the Cape Sable region. The fruits are very viscid, and they were probably brought northward on the feet or plumage of migratory birds. The insert shows a species of wild-pepper (*P. cumulicola*) endemic in Florida. Its distribution is confined to the shell-heaps and habitations of the aborigines.

lots of the town are the live-oak (*Quercus virginiana*) and the cabbage-tree (*Sabal Palmetto*). Among the more abundant epiphytes which grow particularly on the oak are the Spanish moss (*Dendropogon usneoides*) and the little orchid, *Auliza conopsea*. Curiously enough, these two plants, the former with quite simple flowers, the latter with complex flowers, have sepals and petals of the same peculiar shade of green. Immediately south of Daytona, shell-middens, the refuse heaps left by the aborigines, became evident and on these, two additional kinds of trees attract the eye. They are the hickory (*Hicoria floridana*) and a red-cedar which has been included in *Sabina barbadensis*, but which we now feel justified in regarding as different. The insular species bears depressed cones, while the Florida plant has ovoid cones which consequently, are rather longer than thick.

About ten miles south of Daytona we came upon one of the objects of our excursion, namely, a small wild-pepper plant—so far as known at that time the only endemic wild-pepper plant of the continental United States.[1]

This plant is a winter bloomer and was at the height of its flowering season. It was the most conspicuous herbaceous plant on the floor of the hammock, covering the shell-middens for acres. How much more widely it is scattered in that part of the State remains to be learned. This species, like its closest relative in Florida, is now known in only three localities—in all cases on these prehistoric middens: at the locality just mentioned, on shell-mounds at the mouth of the Saint Johns River, where the species was discovered about a century ago, and on apparent refuse heaps, in the mouths of caves, on the western side of Lake Tsala Apopka on the opposite side of the peninsula. In other words, it has been found at two localities near the coast and at one in the interior.

[1] **Peperomia cumulicola** Small. *Piper leptostachyon* Nuttall, Am. Journ. Sci. 5: 287. 1822. *Peperomia leptosachya* Chapm. Fl. S. U. S. Suppl. 645. 1884. Not Hook. & Arn. 1832.

Plants terrestrial, pubescent with short recurved hairs: leaves bright-green; blades of those of the flowering stems and branches obovate, oval, or suborbicular, 3-veined: spikes about 1 mm. in diameter, mostly 2–8 cm. long: bracts suborbicular, about 0.5 mm. in diameter, erose-edged: berries obovoid, borne in depressions in the spike-rachis.

Shell-mounds and entrances to caverns, eastern Florida and northern part of peninsula. It flowers profusely in December.

Here, south of Daytona, often growing with the *Peperomia*, was our smallest spiderwort, *Tradescantella floridana*. This plant, like the *Peperomia*, was at the height of its flowering season. It grew very vigorously and often formed mats, sometimes with a tangled mass of stems and leaves, an inch in depth. Our other spiderworts bear conspicuous flowers usually with highly colored corollas. This one, however, bears relatively inconspicuous flowers much less than a quarter of an inch in diameter, with pale, usually white, petals. The corolla always lies horizontally or flat on the masses of green foliage. The calyx is usually dark greenish-purple. Living specimens collected there were brought to the Garden and they have since served as a ground-cover in parts of Conservatory Range number two.

On an elevation on one of the shell-mounds we were confronted with a small grove of the Indian-cherry (*Rhamnus caroliniana*). This was quite a surprise, as the species has its center of distribution in the mountains and adjacent territory and northern Florida was the supposed southern geographic limit of the species. The trees were in fruit. This fruit consists of black, cherry-like berries about as large as a good-sized pea.

We spent the forenoon in the vicinity of the shell-mounds and then proceeding southward and along the coast without much delay, we ended the day on Merritt's Island. All we could accomplish there was a running view of the flora of the fifteen or twenty miles of the southern end of the island. The experience, however, decided us to place it in our list for further exploration at the earliest possible opportunity, for several dozen shrubs and trees typical of tropical regions were found in the various hammocks along the trail.

One of the few plants collected on the island is worth mentioning here. It is a golden-rod and seems to represent a species different from any heretofore collected. Interest centers in its relationships. Morphologically, it should apparently be most closely associated with *Solidago Boottii* of the southern foothills, Piedmont, and Coastal Plain, but which extends southward only to northern Florida. In habit, curiously enough, it most resembles a mountain golden-rod (*Solidago arguta*) of the Allegheny region and not known to grow south of North Carolina.

On Merritt's Island and the neighboring mainland shore are the southern outcrops of coquina. This rock, however, seems

to have little effect on the vegetation, even though it occurs in sufficient quantities to afford a building stone, and is used quite extensively as such.

As we traveled southward, the more notable shell-middens were left behind, and the flora became noticeably different. While on the subject of shell-mounds we cannot refrain from remarking what an interesting subject for investigation their vegetation would furnish. These areas represent the latest developed native plant associations, for they were built up in recent times, certainly much later than any of the more recent geologic formations, of course excepting active dunes. Their plant covering developed during the process of building by the aborigines or later.

The composite family furnished the greatest number of species noted in flower. On the dry "scrub" the most conspicuous plant was a tall golden-aster (*Chrysopsis*) while in swamps and along streams a tick-seed (*Coreopsis*) eclipsed other flowering plants. The smallest woody plant of the sandy hills south of Eau Gallie was a scrub-oak of uncertain relationship. The shrubs were mostly about half a foot tall and in full fruit, the acorns being mostly about as numerous and as large as the leaves.

At Turkey Creek, near Malabar, we found a native *Portulaca* with tuberous roots, and an Asiatic vine, *Thunbergia fragrans*, that had escaped from cultivation and become naturalized. Along the estuary of Turkey Creek a lead-plant (*Amorpha croceolanata*) was in both flower and fruit. This shrub was described nearly a century ago, but overlooked until recently, when it was reinstated in our flora. Vegetation, however, was not plentiful there. The only other plant much in evidence was a sprawling form of the West-Indian prickly-pear (*Opuntia Dillenii*) which bore notably short fruits.

Midway down the peninsula, two odd plants, inhabitants of the "scrub," appeared and became progressively more abundant, both of them primarily winter bloomers. The one, a knotweed (*Thysanella robusta*), a low, rigid, somewhat woody herb with much-branched panicles bearing myriads of small flowers which heretofore we had found with only white flowers. This season, however, much of the bloom was a beautiful pink. The associate of the knotweed was a shrub-like mint (*Conradina*), and this was as graceful as the knotweed was stiff. It is irregu-

larly branched and bears large, nodding flowers with peculiarly pink corollas mottled with magenta and of a very irregular pattern.

The grassy prairies and low pinewoods between the Sebastian River and the "scrub" were copiously adorned with hundreds and thousands of purple torches—the peculiarly purple inflorescence of a relative of the southern hound's-tongue or vanilla-plant which is closely related to the blazing-star. Its generic name is an anagram of the word *Liatris*, one of the botanical names of the blazing-star, and the plant in question is *Trilisa paniculata*. The only other species, *Trilisa odoratissima*, has been used as a substitute for vanilla, but it apparently possesses a flavor and odor more closely resembling that of the vanilla-substitute, the tonka bean, than it does that of the true vanilla, which is derived from the cured, unripe capsules of the climbing orchid, *Vanilla planifolia*.

This region and its vegetation was quite fully described in a former paper.[1] So suffice it to say here that the three most interesting plants found were a very small sedge (*Eleocharis*) in which the fruits remained attached to the spike-rachis after the scales had fallen away; a species of bushclover (*Lespedeza*) a most unlooked-for plant in that southern region; and the humus-loving orchid, *Habenella Garberi*, growing in the open sandy pine woods, instead of in the hammock, where alone the species had theretofore been observed in Florida.

In the heart of the old sand-dunes the predominating herb was the dog-fennel (*Eupatorium capillifolium*) It stood out in contrast with the other vegetation on account of its large masses of cluster-like plumes. The most prominent shrub was the so-called rosemary (*Ceratiola ericoides*). It was unusually attractive on account of the contrast between its deep-green and the snow-white sand in which it grew. This shrub seems to have two particularly fatal enemies; the one, fire, to which it succumbs quickly; the other, a parasitic vine (*Cassytha*) which is related to the laurel family in structure but in aspect and habit resembles dodder (*Cuscuta*). Scores of beautiful shrubs of the rosemary were buried under such a tangled mass of the parasitic vine that they were not only killed, but actually invisible, the skeleton of

[1] Journal of the New York Botanical Garden **20**: 205–207. 1919.

the shrub merely serving as a trellis for the vine which of course must soon also succumb for lack of nourishment.

In open places at West Palm Beach we found a mallow (*Sida cordifolia*), a plant new to the eastern coast. It has been known on the western coast for many years. Associated with it was the Barbadoes-gooseberry (*Pereskia Pereskia*), a climbing cactus armed with slender spines and bearing broad leaves. It is native in continental and insular tropical America and was discovered wild —natnralized— in Florida about two years ago.

The prairie-marshes along the way exhibited three plants that showed their inflorescences above the turf of grasses and sedges. They were: the purple *Trilisa*, already referred to, a yellow tickseed (*Coreopsis*), and the tall arrow-head, *Sagittaria lancifolia*.

Midway between Palm Beach and Miami there occurred the greatest surprise along the coast. In a flat part of the "scrub" what met our eyes but colonies of an Indian-pipe (*Monotropa*)! It is unlike the northern Indian-pipe (*Monotropa uniflora*) in being larger, and, further, it has more color. The base of the stem is pink, the middle part white, and the upper part, the upper leaves, and the floral parts, are cream-colored.

The afternoon of the day of our arrival in the Miami region was spent in the cactus garden of Mr. Charles Deering. All the plants under cultivation, except some of those from western American and Mexican deserts, were growing well, and the majority of the species were flourishing. One of the most interesting cases and one worthy of record is that of the giant-cactus (*Carnegiea gigantea*). Two plants of this species were introduced from the deserts of Arizona and set out in the garden last June. By the first part of December they had trebled in size. If this plant continues to thrive, as it has every appearance of doing, it may become one of the most conspicuous and interesting of the cultivated plants of southern Florida.

The following forenoon was devoted to the vicinity of Cutler, where some lichens, both epiphytic and epipetric (why not?), were collected. There, too, we saw a plantation of the saw-cabbage palm (*Paurotis Wrightii*), the first experiment of its kind, i. e., planted en masse, several months old.[1] This palm

[1] A single plant of the saw-cabbage palm has been growing in the nurseries of John Soar at Little River, Florida, for twenty odd years. Several isolated plants have been growing on the reservation of Charles Deering at Buena Vista for several years.

has the reputation of being difficult to transplant. However, although many of the main trunks of the individual plants seemed not to have survived the shock of transplanting, the stoloniferous branches at their bases were nearly all starting to grow. Several artificial groves of this palm which Mr. Deering is setting out at Cutler will doubtless soon form interesting plantations. If this attempt at cultivation proves successful, this beautiful palm will furnish a desirable element for decorative plantiug within the limits of its climatic endurance.

In the afternoon of the same day we proceeded to Royal Palm State Park, to which region we devoted two days in exploration.

The first early morning hours of our stay in Royal Palm Hammock were devoted to observations on birds. We arose several hours before sunrise and went eastward into the Everglades. First the night-feeding herons returned to their rookeries from their feeding grounds, then it was the turn of the day-feeding birds; for as the night-shift knocked off, these others left their rookeries and flew to feeding grounds of their own. The birds came and went on schedule time. The course of this daily migration is mainly up and down the sloughs forming the headwaters of Taylor River.

A day was spent in the Everglades between Royal Palm Hammock and West Lake, twenty-odd miles to the southwest of the hammock, or on the borderlands of the Cape Sable region.

A few miles southwest of the hammock are two very interesting phenomena. The first is botanical. It is the northern inland limit of distribution of the saw-cabbage palm (*Paurotis Wrightii*), already referred to. The outposts are scattered, comprising isolated colonies and colonies in Everglade hammocks. Further south, however, the palm is often the striking feature in the landscape. The second phenomenon is geological. It is more interesting than the first, yet it is invisible!

Among many interesting questions that arise in the course of our study of the plants in Florida, one in particular is often forced upon one's attention. It is this: was the flora in later geoiogical times more extensive or more limited than it is at the present time?

We know that great changes have taken place in the plant-covering of the State. There is plenty of direct evidence that the white man has wrought destruction in the last few genera-

tions. We know that the Seminole Indian did his part in changing the vegetation through his mode of life and methods of hunting game. We are safe in assuming that the aborigines, perhaps a succession of aborigines, did their share in modifying the flora. If we do not have documentary evidence in the case of the aborigines, we do have circumstantial evidence in the shell-middens and other mounds.

The next question that arises, is what hand had nature in changing the flora? Has the land been elevated or depressed in relatively recent times?

Florida is well supplied with evidence of geologic changes, both superterranean and subterranean. Some of the rivers of the southeastern coastal region, for example, the New River and the Miami River, have deep channels that have been sculptured in the eastern rim of the peninsula. These would indicate that the land—at least on the eastern side—was formerly more elevated.

Now let us consider certain more recent and, as it seems to us, more interesting evidence.

During the last week of December 1917, I received the following information from Charles A. Mosier, custodian of Royal Palm State Park:

"Dredge on road is about four and a half or five miles from the park, making slow progress. It will be two years or more before it will reach Cape Sable. The dredge threw up some peculiar rock when they were working last week. One of the engineers called it petrified cypress trees, but it looks more like stalactites. Some of the bases must weigh a ton or more. I am anxious for you to come down as I wish to show them to you before the grading covers them."

The dredge referred to was one working on the extension of the Ingraham Highway which is planned to connect Miami with Cape Sable.

Southwest of Royal Palm Hamock the oolitic limestone in most places lies a few inches beneath the marl of the prairie. The water table, at its minimum, is relatively a few inches beneath the surface of the limestone. So, in making roads in that part of the Everglades, a dredge excavates the rock in front, according to the size of the road and depth of water desired. The shattered rock is thrown up on one side and a substantial

road-bed and a navigable canal result from the one operation.

In the case of the above-quoted incident, a difference in the rock was noticeable in drilling preparatory to blasting. The blast shattered the top of a subaqueous cavern! Stalactites varying from the diameter of a finger to over four feet were thrown out. Unfortunately, but naturally, there were no perfect stalactites, as the shock of the dynamite had broken them into irregular sections. The dipper of the dredge, terminating a boom nearly thirty feet long, was let down into the cavern and swung around in all directions without encountering any obstructions. Here in the wet Everglades is a subaqueous cave. Yet the sections of the stalactites indicate great length and they could only have been formed in a cavern in which the floor, or at least the upper portion of the cavern, was elevated above the water table.

This is only one evidence of various hidden phenomena and structures in Florida—things submarine and things subterranean.

We are thus forced to believe that southern peninsular Florida was at no very remote date, geologically speaking, much more elevated than it now is, perhaps as much as fifty feet, possibly more. If this were the case, the present Florida reef on which the Florida Keys stand and the reef along the eastern coast out to the Gulf Stream, as well as, most likely, much of the present bed of the Gulf of Mexico adjacent to the western coast, was then dry land. However, just what the topography and the vegetation of southern Florida was at that time will remain a mystery forever.

All this brings up another question: Is the Florida peninsula at the present time rising or sinking?

The canal and road-bed of the new highway beyond Royal Palm Hammock are making accessible a region hitherto unvisited by naturalists.

The end of the canal at the time of our visit (December 1919) was in an arm of West Lake, which is a body of water of uncertain geographic position, on or near the Dade-Monroe County line, and not far from the Bay of Florida. The land is rather low there, but not very far to the westward there is more elevation. This constitutes the eastern extension of the Cape Sable region of Florida. Much of that region will be readily accessible with-

in a short time and it will doubtless yield many interesting plants, as well as develop unusual problems.

In former times that region was one of the favorite hunting grounds of the Seminole Indians. It was a closed country to the white man, except to the more venturesome—particularly those who were in search of plume-birds. Even now if one happens to meet an Indian in the southern end of the Everglades and asks him where the plume-birds are he will invariably point in the direction of the Cape Sable region.

During our short stay in the low hammock about West Lake, we discovered an additional species of the wild-pepper (*Peperomia*) for the flora of Florida as well as for that of Continental United States, as the genus *Peperomia* does not occur in the States outside of Florida. Among other noteworthy finds were one of our rarer epiphytic orchids (*Oncidium sphacelatum*), growing in more luxuriant masses than we have seen it elsewhere in southern Florida, and the large epiphytic cactus, a prickly-apple (*Harrisia Simpsonii*), which grew invariably on logs and tree-trunks, usually two to six feet above the hammock floor. Here, it had taken itself to the trees just as about Cuthbert Lake, where we found it several years ago, and where it sometimes occurred ten or twelve feet up in the mangroves.

Upon our return from the Cape Sable region we set out for the Lake Okeechobee region, whence we had hoped to continue across the peninsula to Fort Myers. Our course was the same as that described in a former paper. In brief, it was northward along the eastern coast to Jupiter, thence northwest through Hungry Land and the Alapattah Flats and the shore of Lake Okeechobee to Okeechobee City.

On the way we stopped long enough to visit the recently discovered Indian-pipe, and a further search in the vicinity of our first discovery brought to light a copious growth of that interesting plant in all stages of development, from mere buds pushing up through the sand to fully mature fruiting colonies with ripe capsules and dried stiff stems.

Striking westward into the wilderness at Jupiter and crossing some belts of "scrub," pineland, and streams bordered with hammocks, we came into Hungry Land with its numerous shallow ponds. Many of the ponds were inhabited by scraggy cypress trees which, however, were less stunted than those occur-

ring southwest of Royal Palm Hammock referred to in previous papers.[1]

In Hungry Land the most conspicuous plant, as was the case on the prairies back of Sebastian, seventy-odd miles further north, was the false hound's-tongue (*Trilisa paniculata*). There were several other kinds of plants in bloom, but the region was not the showy flower-garden of the previous spring, as described in a former paper,[2] for, although the season was not winter in a technical sense, it was really the mid-winter of that region.

However, many plants were in evidence, although not ubiquitous as they would be in the spring. Among others was a closely prostrate kind of *Houstonia*, perhaps new to science. It bears small, roundish leaves and small, slender trumpet-shaped, white flowers.

About the cypress ponds were a tall pipewort with large, white, button-like head standing on top of the slender, ribbed stalk, also a bright-yellow flaveria, and some small asters, while the most elegant of all the southern asters, *Aster caroliniana*, clambered up into the cypress trees, and bore myriads of large showy heads of yellow and purple flowers.

On the edges of the ponds one may find more or less hammock growth, composed chiefly of swamp-bay (*Tamala*), Saint John's wort (*Hypericum*), gallberry (*Ilex*), queen's-root (*Stillingia*), and wax-berry (*Cerothamnus*), all of which were in flower, while in the ponds, the water-lily (*Castalia*) and the spatter-dock (*Nymphaea*) flourish.

Two plumose kinds of dog-fennel were in flower, the one, *Eupatorium capillifolium*, tall and coarse in the drier places, the other, *Eupatorium leptophyllum*, low and delicate, in the moister spots.

The mixture of rich soil and sand thrown up from the slough by the dredge along the Saint Lucie Canal supported a luxuriant growth of herbs and vines. Asters as high as one's head and dog-fennel (*Eupatorium capillifolium*) twelve feet tall attested to the fertility of the soil.

The Alappatah Flats on the northern side of the Hungry Land

[1] Journal of The New York Botanical Garden **21**: 53. 1920; **22**: 64. 1921.
[2] Journal of The New York Botanical Garden **22**: 30. 1921.

Slough were nearly flowerless. After passing some temporary Indian camps in the hammock near the canal we again came into the pinewoods. There, the two plants that were most visible in the failing light of the evening were the bleached skeletons of a composite (*Carphephorus*), which is related to the blazing-star (*Lacinaria*), and a wire-grass (*Aristida simpliciflora*), which grew in large colonies and was particularly in evidence on account of the persistent and tangled masses of the long awns of the inflorescence, which terminated the stems.

Before we had emerged from the flats the sun had set, and as a result of several unexpected previous and subsequent interruptions to our prearranged schedule, we reached Okeechobee City much nearer midnight than sundown. The chief causes of delay were a series of shallow sloughs on the border-land between the Alapattah Flats and the Okeechobee prairie, in the quicksands of which our cars bogged. Then, there was the necessity of making a new trail part way up the shore of Lake Okeechobee in place of the old trail which was then submerged on account of the partial filling up of the lake basin by the summer and fall rains.

The following morning brought us the information that the prairies between the Kissimmee River and the Caloosahatchee were flooded to such a depth that a detour of approximately one hundred miles would be necessary in order to get to Fort Myers. In fact, it was reported that there then was more surface water west of Lake Okeechobee than at any time in the past six years.

Consequently the expedition to the Fort Myers region was canceled. However, it was not the detour that decided us against carrying out our plans, as distance means but little nowadays in Florida; but the abnormally high water made the accomplishment of the main purposes of our proposed excursion impracticable. The deferred plans will be carried out at a future date when time is available and meteoric conditions are more favorable.

As an alternative we went to Fort Bassenger, which is situated northwest of Okeechobee City, by trail twenty-odd miles distant. The fort was located about a mile and a half south of the present crossing of the Kissimmee.

The present owner of the site where the old fort stood, a son

of a soldier in the army during the Seminole Wars, who remained in that part of Florida, told us that when he settled there, about thirty years ago, relics in the form of parts of harness, horse-shoes, pieces of ammunition, and silver coins were quite abundant. By that time the stockade had disappeared, but a plow would often strike the stumps of old posts that still remained in the ground. It was at this point that Zachary Taylor crossed the Kissimmee River and on Christmas day, 1837, inflicted a severe defeat on the Indians, near Onothohatchee Creek during that unfortunate period of our domestic history. The latter stream now usually bears the name of Taylor's Creek, and is near the present site of Okeechobee City, which name supplants that of Tantie, the name of the earlier settlement there.

Back from the western bank of the river there is a sand ridge and a swamp. The ridge is covered with a scrubby growth of oak trees and miscellaneous shrubs. A half dozen kinds of oaks were collected and all of them were in fruit, a condition not often met with in these scrub-oak regions. Several mosses, characteristic of dry places, particularly a kind of *Campylopus*, were in abundance, as were also some lichens.

The swamp was overgrown with tall trees of the sweet-bay (*Magnolia virginiana*). The trees were so tall that from a distance the swamp had the appearance of a prominent elevation much higher than the sand-ridge, but it is really much lower. The sweet-bay trees showed a very dark-green when the air was still, but when disturbed by the breeze the whole bank of green was turned to a glistening silver-white on account of the pale under side of the leaves. Associated with the sweet-bay was the loblolly-bay (*Gordonia Lasianthus*). This kind of swampy hammocks are not unusual in the lower places in that region. In the flowering season they doubtless present an attractive sight on account of the numerous white flowers, those of the sweet-bay magnolia-like, those of the loblolly-bay camelia-like. There is often present, also, a holly (*Ilex Cassine*) with rich green leaves and bright red berries.

Returning to the bridge we recrossed the Kissimmee River, which at that season was full to overflowing. Not only was the channel filled, but the wide flood-plain was submerged. The flood-plain was, however, not deserted. The cattle that are

accustomed to grazing on the turf that covers it in periods of dryer weather were now standing in the water feeding on the water-plants which formed great floating mats of succulent vegetation. These half-wild cattle are largely aquatic anyway. On several occasions in crossing the Kissimmee on former excursions, we have seen this Florida stock take a notion to cross to the other side of the river, plunge into a swift current, and swim to the opposite bank with more grace than they ever exhibit "on the hoof."

From the eastern side of the Kissimmee we headed for Okeechobee City. After traversing several miles of pineland in which there was little to attract the attention at that time of the year, except several yellow-blossomed members of the sun-flower family, we again came out on the prairies where few shrubs but numerous large and small herbaceous plants invited attention. The more prominent shrub, aside from the wax-myrtle, was a small-leaved holly, which undoubtedly represents a species not hitherto recognized.

Several low parts of the prairie, each many acres in extent, were covered with a pale grass with stems about a yard high and so closely set that the effect of a low-hanging mist was produced.

The smallest flowering plant on the low prairie was a member of the figwort family, with the generic designation of *Hemianthus* (meaning half a flower), referring to the very irregular and one-sided development of the corolla. It is readily visible only *en masse* when it forms bright-green, prostrate mats on the wet sand. It was in full flower where we found it, but the flowers are scarcely visible without the aid of a hand-lens. In strong contrast to this minute plant was a very large flag (*Iris*), the two plants often growing side by side. The flag, with leaves a yard tall or more, covers acres of prairie. The plants were approaching their flowering season, for we had found the large cucumber-like fruits in the same locality the previous spring. When in flower those vast areas of iris doubtless form seas of blue on account of the myriads of large blue flowers which are borne on stems three to four feet tall.

Four different plants of the sunflower family were in evidence. They represented rather closely associated genera: Two were fleabanes (*Erigeron quercifolius* and *E. vernus*). The third was

an aster (*Aster Simmondsii*), and the fourth a boltonia (*Boltonia diffusa*). The aster and the boltonia resembled each other so closely in habit that it was not until the involucres and the fruits were examined that their relationships were evident.

The higher prairies were not without their herbaceous plants, flowering in season. One of the more conspicuous was a tall, slender goldenrod (*Solidago angustifolia*), with a greatly elongate inflorescence. It ranges from the seacoast to the interior. Another was a slender rayless-goldenrod (*Chondrophora nudata*) with a flat-topped inflorescence. In addition to these there was a large-headed composite (*Helianthella grandiflora*) resembling a sunflower.

The inconspicuous plants then in flower were an orchid relative—*Burmannia biflora*—with short, hair-like, minutely scaly stems mostly terminated with a pair of colored but very small flowers of peculiar structure, and a low-creeping spike-rush (*Eleocharis*).

About sundown, just as the moon-flowers and the morning-glories were opening for the night, we returned to Okeechobee City, spent the night there, and early the following morning set out towards the northeast for Fort Pierce.

Our first collecting ground was the hammock of Mosquito Creek, six miles east of the Onothohatchee or Taylor's Creek. There asters and goldenrods were in bloom, and the largest southern ladies'-tresses (*Ibidium cernuum*) was at the height of its flowering season. The larger plants were a yard tall and bore spikes of white flowers six to ten inches long.

The next stop was six miles further eastward in the hammock of Cypress Creek. This hammock is larger than that of Mosquito Creek. Both hammocks, however, have a copious growth of river-cypress (*Taxodium distichum*) in addition to the broad-leaved trees. There was more variety in the asters here, and a peculiar violet with white flowers appeared. Also, the ladies'-tresses mentioned above grew here in great luxuriance and also another terrestrial orchid (*Habenella Garberi*).

After a drive of six more miles we stopped to investigate a small low prairie where numerous but almost uniformly small-flowered plants grew intimately intermixed, all together forming a close turf. Many families from the grasses to the sunflowers were represented. Several interesting and critical spe-

cies of nut-rush (*Scleria*) and of beak-rush (*Rynchospora*) were represented in abundance.

At least three kinds of bladderworts were there, but one, a member of the genus *Stomoisia*, was ubiquitous. It was a wiry-stemmed plant a few inches to two feet tall, with small yellow flowers. It is apparently a small-flowered form of *Stomoisia juncea*. The composite of those prairies, then in full bloom, was the common *Chaptalia semiflosculare* of the southern States, where it usually blooms in the spring. This locality is near to its southern geographic limit, for, a little further south the West Indian *Chaptalia dentata* takes its place in the flora. That small prairie harbored two species of ladies'-tresses,—*Ibidium Beckii* and *I. laciniatum*,—both, however, much smaller plants than the *Ibidium cernuum* mentioned above.

On these prairies the pond-cypress (*Taxodium ascendens*) replaces the river-cypress (*Taxodium distichum*). At several localities we learned from observation that the twigs produced from wounds on the lower parts of the trunks of the pond-cypress and on stumps bore foliage resembling that of the river-cypress. It may be of interest to record that a case similar to this happened several years ago on one of the trees of the pond-cypress cultivated in the New York Botanical Garden, where both species are hardy, although at a latitude considerably north of their natural geographic limits.

After a series of prairies were crossed we came to the pinelands and then to the "scrub" on some of the dunes of which Fort Pierce is built. Turning southward at Fort Pierce we reached Miami in the evening.

Next we visited the Deering Snapper Creek hammock and the Matheson Snapper Creek hammock for the purpose of collecting plants and studying the erosion of the limestone. Certain types of erosion in these hammocks correspond with those often met with in the pinelands and have an important bearing on some studies on the erosion of the Miami oolite which we will publish at a future date.

The Deering Snapper Creek hammock[1] was once one of the

[1] This hammock has recently become the property of Mr. Charles Deering and is being kept in its natural condition. The Deering hammock at Cutler, the monarch of the hammocks of the Everglades Keys, referred to on a subsequent page, is also being maintained by Mr. Deering in its natural state. Pumpkin Key, one of the unique islands of the reef, is also maintained in a state of nature by Mr. Deering.

Meccas of the Miami region, and is just as beautiful as formerly, so far as its vegetation is concerned. Furthermore, it contains the largest bustic-tree yet observed. The trunk-diamete- is about twenty-seven inches. There in the vicinity of this tree the first tropical filmy-fern (*Trichomanes punctata*) was found in the continental United States nearly twenty years ago.

Before the drainage fever became epidemic and rampant among the inhabitants of southern Florida, this hammock had other charms in addition to its vegetation. It possessed a superterranean stream and a subterranean stream, part of which, at least, emerged in a boiling spring. Both streams were part of the natural drainage of the Everglades. Now a drainage ditch has lowered the water table beneath the bed of the stream, and, it is said, by an error on the part of the engineer, the ditch was dug directly through the boiling spring. The stream above referred to represented the southern geographic limit for the quillwort (*Isoetes flaccida*), and until a recent date, the southern station for the hand-fern (*Cheiroglossa palmata*), which grew on the cabbage-trees (*Sabal Palmetto*) that stood along the stream. In the vicinity of the spring there once occurred the largest wild or semi-wild avocado trees (*Persea Persea*) and mango trees (*Mangifera indica*) in Florida, and also wild guava trees which bore nearly seedless fruits of a delicious flavor.

The Matheson hammock[1] has fully as beautiful a growth of shrubs and trees as the Deering hammock and it has not been directly devastated by a drainage ditch, although the lowering of the water table by a drainage canal in the adjacent prairie has changed the character of some of the shrubby vegetation, unfortunately not for the best. Moreover, there may be seen the remains of devastation wrought by a former generation. There the early settlers, like the recent homesteaders on the Everglade Keys, felled a large number of the giant trees of the hammocks merely to let them lie and decay through succeeding generations. It is remarkable how conscientiously and uniformly the pioneers wrought this devastation, seemingly just

[1] This hammock is being maintained in its natural condition by Mr. W. J. Matheson, who is also preserving Lignum Vitae Key from devastation. In this connection it should be mentioned that Mr. James Deering is preserving a part of the fast disappearing Brickell hammock from devastation.

as if it were one of the federal requirements for getting title to the land.

Each hammock of the Everglade Keys has one or more peculiar features in its vegetation. In the Matheson hammock there is an abundance of a very peculiar fern, a spleenwort (*Asplenium serratum*), with large simple leaves one to three feet long. This hammock represents the center of development of the fern. There is a more copious growth of it here than in all the other hammocks of the Everglade Keys put together and this locality doubtless represents the first place where the fern was discovered this side of the Gulf Stream, nearly half a century ago.

Fourteen miles of the barrier beach north of Miami were traversed for the purpose of comparing some of the dune plants with those of the Bahamian flora and for examining prickly-pears (*Opuntia*). There are numerous individually interesting kinds of flowering plants on the dunes between the ocean and Bay Biscayne comprising both rare and endemic species. The two most evident areas of plant associations were the wind-swept dunes on the ocean side and the mangrove hammock on the bay side. On the one hand the land was high and the shrubs and trees low, and on the other, land was low and the trees high. The most striking growth there is the mangrove hammock along the bay and the smaller lagoons. By a combination of the configuration of the land and the sweeping action of the winds, the mangroves are like a giant hedge. Starting low at the inner edge of the dunes, they slope gradually upward or rise in terraces just as if they had been trimmed by a pair of mighty shears. Among the mangroves are large areas of the leather-fern (*Acrostichum aureum*) and a copious growth of the rubber-vine (*Rhabdadenia biflora*), which climbs high in the trees and bears myriads of large white flowers which are most conspicuous in the forenoon. The rubber-vine, by the way, is properly so-called. It does yield rubber, but it is doubtful if this fact will ever make it attain commercial importance owing to the smallness of the vine. On the mangrove trees themselves grow several kinds of air-plants (*Tillandsia*) and our only endemic tree-orchid of a tropical type, *Encyclia tampense*.

Following these short excursions on the mainland our activities were transferred for three days to several of the keys of the

Florida Reef. We had the advantage of Mr. Hugh Matheson's fast motor-boat "Naisha" which Mr. Matheson navigated personally. A settlement named Islamorada on Upper Matecumbe Key was our first objective.

Once on Upper Matecumbe Key interesting plants were not long in coming to our notice. Two noteworthy sedges—galingales—were found in quick succession, the one, *Cyperus Pollardi*, new to the flora of the Florida Keys, and the other, *Cyperus Blodgettii*, hitherto known this side of the Florida Straits only on Key West, where it was originally discovered many years ago, but not since found in the United States. In recent years, however, it was discovered in the Bahamas and in Cuba.

During the first evening on the key we received a report of a planting of some "royal palms" that were found on Long Key, about a mile south of where we were stopping for the night. This report was both welcome and interesting, and our first move the following morning was to investigate the palms which proved to be as we had suspected, the hog-cabbage palm (*Pseudophoenix vinifera*), and not the royal-palm (*Roystonea regia*). This palm was found for the first time in Florida on Elliott's Key in 1886, and on Long Key some time afterward. It had been reported as extinct at both localities in Florida—a report since proved untrue; and rather recently it has also been found in the Bahamas on the keys of Cuba and in Hispaniola, where it was first discovered about the beginning of the eighteenth century.[1]

In the vicinity of the palms we found an abundance of a West-Indian pink-root (*Spigelia anthelmia*) which had been previously collected in Florida only on Elliott's Key, and specimens of the sweet alyssum (*Koniga maritima*), which so delights in the coasts of parts of Europe, the seed of which had probably been blown from nearby gardens during storms, and which had later sprung up in this truly maritime locality.

After settling the palm question we transferred our activities to Lignum-Vitae Key, which lies in Barnes Sound inside of and between the two Matecumbe Keys.

[1] A complete history of this palm will appear in a subsequent number of this Journal.

Lignum-Vitae Key was inhabited many years ago, as is evidenced by curious ruins, stone fences, and wells, and by exotic trees. One of the latter, a giant tamarind (*Tamarindus indicus*) measured about seven feet in circumference around the trunk five feet above the ground. The island is about to be improved and preserved by Mr. W. J. Matheson, who will protect all the original forest, which comprises many interesting tropical trees, some of them represented by good specimens.

Two conspicuous herbaceous plants were in bloom. On the exposed lower parts of the Key the sea-lavender (*Limonium brasiliense*) bore myriads of rose-purple flowers, while in the high hammock the native lead-wort (*Plumbago scandens*) sprawled over the rocks and shrubs well furnished with clusters of paler, but much larger flowers than those of the sea-lavender.

The Easter of the shrubs and trees had not yet appeared in the interior of the hammock, but around the edges the joe-wood (*Jacquinia keyensis*) was in full bloom, and the flowers filled the air with a delicious fragrance resembling that of the tropical buckthorn (*Bumelia angustifolia*), which, moreover, belongs to a family rather closely related to that to which the joe-wood is assigned.

Along the prairie-like areas, between the hammock and shore, the wild cotton trees (*Gossypium*), everblooming and everfruiting, and the dildoe (*Acanthocereus pentagonus*), then fruiting, together made tangled thickets. There we solved the origin of the specific name of the dildoe, namely, *pentagonus* i. e., five-angled. Almost invariably the mature stems of this cactus are stout and three-angled or three-sided, although the seedling plant starts with a slender, several ribbed shoot. The specimens on which the species was founded evidently had a five-angled stem, even if it is an exceptional condition. And there, on Lignum-Vitae Key, following many years of observations and search for such a specimen, we finally found one.

During the afternoon we returned to Upper Matecumbe Key and sought an area of original hammock for exploration. Although we found some rather tall forest, we are inclined to think it was second growth. Moreover, it is reported that the whole island some thirty years ago was cleared and planted with pineapples. Others of the Florida Keys were profitable pine-apple plantations in those days, before the lower eastern

coast of the peninsula was readily accessible. The industry was later transferred to the mainland on the vast stationary sand dunes mainly in the vicinity of Saint Lucie Sound.

Upper Matecumbe Key is now largely planted with lime trees. However, we found a strange tree, unfortunately in leafage only, evidently a *Pisonia* relative. Also, we definitely established the occurrence of the tree cactus, *Cephalocereus Deeringii*, on that island by the finding of a single flower on one of the large specimens. This plant was discovered on Upper Matecumbe Key several years ago, but not until our visit was a flower obtained.

One of our endemic boneset relatives (*Osmia frustrata*) grew plentifully on both Upper Matecumbe Key and Lignum-Vitae Key. The plants were blooming and were conspicuous on account of the numerous blue or purplish heads which resembled little paint brushes. On the keys the plant is mostly only knee-high, but in the Cape Sable region, on the mainland, it often grows up to six or eight feet.

It was unanimously decided to devote the forenoon of our last day on the Keys to an examination of Indian Key. This historic island is on the reef outside of the main line of keys and opposite the interval separating Upper Matecumbe and Lower Matecumbe Keys. It is nearly circular in outline and comprises about six acres. It was once a port-of-entry. The island became notable through the activities and the subsequent death of Henry Perrine,[1] who settled there in 1838, making it both a

[1] Henry Perrine was born April 5, 1797, at New Brunswick, New Jersey. In youth he taught a school at Rocky Hill, N. J., then studied medicine at Philadelphia. After five years (1819-24) as a physician at Ripley, Illinois, and three (1824–27) at Natchez, Mississippi, he spent ten years (1827–37) as United States Consul at Campeche, Yucatan. While there he devoted himself with great singleness of purpose to securing for transportation to the United States various plants of economic value. This was peculiarly difficult, because the local officials were very much opposed to the export of living plants of economic value, and it was only by Perrine's influence as the most popular physician in the region that he was able to overcome the obstacles placed in his way. Upon his return to the United States, in 1837, he spent six months at Washington pressing his claims for Congressional assistance in his schemes for the introduction and propagation of tropical plants in the United States. In 1838, he received a grant of a township of land on Biscayne Bay, Florida, but the disturbances occasioned by the Seminole War,

In Deering hammock, Cutler. Natural rock pedestal and flower-pot in foreground; jungle of cocoaplum (*Chrysobalanus*) in background. The one-time uniform layer of oolitic limestone, represented, approximately, by the top of the rock-structure has been eroded and removed mainly by the seasonal fluctuations of the water-table. The pedestal represents a hard core of rock that has resisted the processes of erosion. The surface is a rock filigree, the structure of which is more plainly shown in the insert. Ferns, in this case the sword-fern, herbaceous and woody flowering plants occupy the tops of pedestals and tables.

temporary residence and a nursery, pending the end of the Seminole Wars, when he contemplated moving to a large grant of land on the Florida mainland. Before he could consummate his long prepared and cherished plans, he was murdered by a band of intoxicated Indians who were being crowded southward by the advance of the white man's civilization.

Only three things remain on the key to indicate the improvements of a century ago. They are the masonary foundations of the former buildings, some commonly cultivated tropical trees, and, what is much more interesting, numerous descendants of the sisal (*Agave rigida*) plants Dr. Perrine evidently introduced as part of his nursery stock.

The stone slabs once placed near the middle of the key to mark the graves of Perrine and others, intact until quite recent years, have of late been destroyed or removed, perhaps, by vandals or treasure hunters.

Several modern frame houses, now deserted and not only unprotected, but plundered of their contents, ready to be consumed with the first fire that sweeps the island, stand on the higher part of the key.

We returned to Upper Matecumbe Key at noon. Our plan to stop on Tea-table Key, which lies near the outer side of Upper Matecumbe, and was at one time a naval base, was defeated by lack of time. We reached Miami in the late afternoon, the "Naisha" making the record run of eighty-odd miles in four hours and twelve minutes.

The day following our return from the Keys was devoted to collecting flowerless plants in the Deering hammock at Cutler. The moister parts of this hammock yielded numerous species of lichens, hepatics, and mosses.

The erosion of the limestone in the lower parts of this hammock is different from that of any of the other hammocks of the Everglade Keys. The rock is a very pure limestone, with scarcely any sand in its composition. In ordinary rainy sea-

then in progress, prevented him from occupying his grant. He did settle however, upon the neighboring island, Indian Key, where he was killed by a band of marauding natives, August 7, 1840. After killing him, the Indians burned his house, destroying all his manuscripts and collections. His family escaped, and he might have done so if he had not hoped to dissuade the Indians from doing harm.—John Hendley Barnhart.

sons the water-table rises, and water fills the area to a depth of two or three feet. The water is essentially stationary sometimes for long periods. Whatever movement there is, is not horizontal, but perpendicular, and, of course, very slow, but it is this perpendicular movement of the water that causes the curious, often fantastic, results of erosion. Naturally, the maximum duration of submergence is near the floor of the hammock, so that the water charged with the acids of decaying vegetable matter and with carbon dioxide works longer and stronger on the lower parts of the rock than on the upper. As a consequence, the maximum erosion is near the hammock floor and we find urns, flower-pots, tables, pulpits, cañons, caves, tunnels, natural bridges, all of which, together with the accompanying arboreous vegetation, particularly the buttressed pond-apple (*Annona*) trees, constitute a series of grottoes different from any others in the State.

The uneven structure of the rock, hard and soft, results in an uneven surface resembling lace-work or filigree. What loose material is dissolved out of the limestone must of necessity fall to the hammock floor, for there is no current of water or other means to transport it. The hammock floor is usually nearly or quite free of sand, which would naturally accumulate there if it came out of the rock. The floor is mostly covered with humus formed from the continuously decaying vegetable matter.

Upon returning to Miami that evening, it was decided to start north along the eastern coast for a two days' excursion, particularly for further studies in cacti and wild-pepper plants, for a rapid survey of the vegetation along the way, for photography, and to prosecute some scout work for future investigations.

We traveled as far as Stuart before midnight and ran into a "norther." Being uncomfortably cool we stopped there and helping ourselves to some unoccupied rooms in the principal hotel we spent the rest of the night comfortably.

Early in the morning we set out for the hammock along Saint Lucie Sound in order to get a photograph of a wild-pepper plant (*Peperomia humilis*); however, the strong gale of the "norther" which was against us decided us to drive on to Daytona where we arrived just before sunset.

All the way from Fort Pierce to Daytona the effect of the chill of the "norther" could be seen on the flowers of the moon-vine. During the previous night we had noticed that the moonflowers along the way had not opened. Early in the morning the buds had for the most part failed to open; but as the sun warmed the atmosphere the buds burst forth and we had moonflowers all day long, as a result of the retarding effect of the low temperature of the preceding night. Thus one also may have a night-blooming cactus flower in the day-time if the bud be put on ice during the night in which it would normally open.

Notwithstanding the fact that winter conditions prevailed generally, technically or according to the almanac winter had not come; it was really the last weeks of autumn. However, along the way, particularly in the vicinity of Vero, the cinnamon-fern (*Osmunda cinnamomea*) had skipped winter and indicated spring. The tall red spore-bearing leaves were in their glory, and in addition, a score of spring-flowering herbs were associated with it. The spruce-pine (*Pinus clausa*) had come into flower during the two weeks' interval since we had passed through the same country, and its yellow flower-cones were in prominent clusters among the leaves.

A scattering of tropical shrubs was observed along the lagoons, particularly those with baccate fruits. They are probably sown by migratory birds, and finding congenial localities, sprout and survive. However, they never grow with the vigor they exhibit near the southern end of the peninsula. Among those in flower at that time was the marlberry (*Icacorea*) and the myrsine (*Rapanea*). The former shrub occurred as far north as Daytona.

On this ride two things conspired to make one think he was in a higher latitude than Florida. First, there was the cold stiff breeze of the "norther." Then, the fruiting plants of the tropical hemp-vine (*Mikania cordifolia*) suggested, especially when one was half numb as a result of riding against the cold wind, the fruiting vines of the virgin-bower (*Clematis virginiana*) of the North.

One quite unusual sight presented itself at several places on the old dunes which formerly had been under cultivation as pineapple fields. A fern had become a rampant weed. Many acres of former fields had been taken possession of by the brake

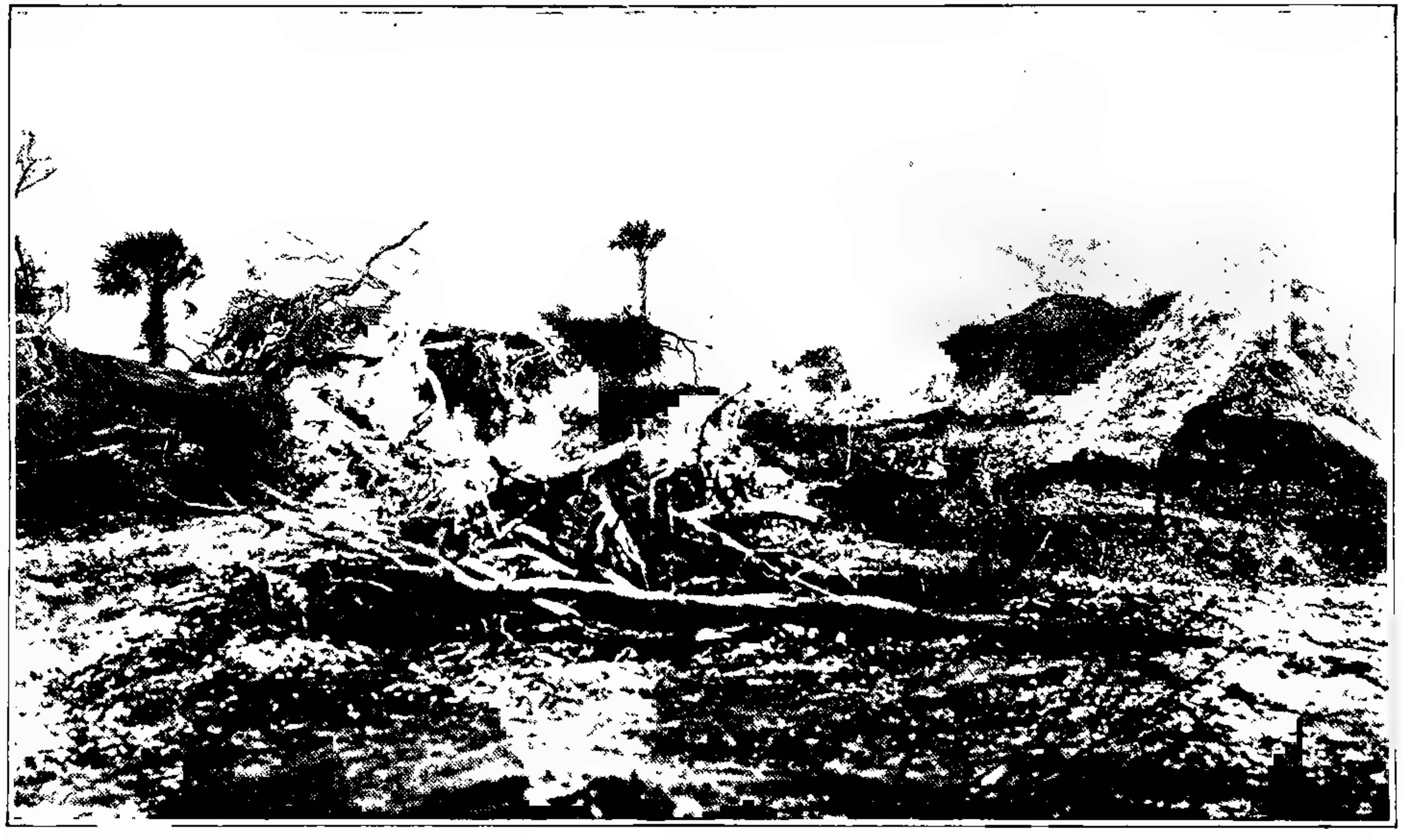
(*Pteris caudata*) which grew there to the exclusion of nearly all other vegetation. The rapidly growing underground stems of this fern enable it to spread rapidly in the loose sand and to crowd out most of the plants that would naturally grow with it.

Returning south again we were able to complete the record of a section of the vegetation on the mainland facing the various lagoons along or near the Dixie Highway from Daytona to Miami or from the Halifax River to Bay Biscayne.

From Daytona to New Smyrna the Halifax River is lined with hammock, usually close to the water's edge. From New Smyrna to Oak Hill hammocks predominate, but some pineland is interposed. About sixteen miles south of New Smyrna, near Oak hill, wide marshes with palmetto hammocks not only occur near the lagoon, but also extend far inland; thence to Titusville hammocks and stretches of pineland appear again.

For the distance of twelve and a half miles south of Titusville are stretches of "scrub" and pineland interrupted here and there by small areas of hammock. Between five and six miles north of Cocoa, hammock appears and extends southward about fifteen miles or to about eight miles south of Cocoa. Thence there is "scrub" or pineland to Eau Gallie, where there are small areas of hammock, particularly about the mouth of Elbow Creek. South of Eau Gallie there is "scrub" and pineland to near Melbourne, where there is a little hammock about the mouth of Crane Creek. Thence southward we find stretches of "scrub" and small hammocks to the hammocks at the mouth of Turkey Creek. South of Turkey Creek as far as Malabar there is "scrub" and low oak hammock. Thence southward alternating pineland and "scrub" with a hammock about six and a half miles south of Melbourne.

Below Grant there is some hammock, then about a mile of "scrub" and some hammock near the fifteenth mile post south of Melbourne. Again, some "scrub" and then the hammocks about the mouth of the Sebastian River about eighteen miles south of Melbourne. One mile south of the Sebastian River, there is a small area of "scrub," thence pineland and hammocks with palmettos to Quay. Thence "scrub" or "scrub" and pineland mixed, and an occasional piece of hammock in low places to Vero. South of Vero "scrub" or near Oslo some pineland and hammock reaches the lagoon. "Scrub" is in evidence or predominates thence to Fort Pierce.



Remains of aboriginal shell-midden on Halifax River. There the red-man once feasted. Accumulations of shells, mainly oyster, clam, and conch, representing the habitations or rendezvous of aborigines, often occur along the coasts of Florida. These prehistoric monuments vary in size from a mere handful of shells to mountain-like masses up to eighty feet high. They are covered with an arboreous growth. and devoid of soil; the only matter aside from the shells is disintegrated shell material, charcoal, bones of animals, and the humus derived from the decay of the vegetation that has clothed them. Unfortunately the mounds are being drawn on for road material. With their destruction, interesting plant associations disappear.

South of Fort Pierce hammock appears again and extends along the shores of Saint Lucie Sound for a distance of about sixteen miles. Some of this hammock is apparently in its primeval condition, but much of it has been partly or wholly cleared. From the vicinity of Jensen and Rio, "scrub" on high rolling sand-dunes, with here and there a little hammock growth, extends to the estuary of the Saint Lucie River, where, of course, there is hammock. From the Saint Lucie River (Stuart) southward for about seven miles, there is a succession of pinelands and "scrub," with the two pines—*Pinus clausa* and *P. caribaea* —more or less mixed. From about twenty-nine miles north of West Palm Beach to the twenty-first mile post, there is a long stretch of nearly or quite pure "scrub," then some pine-woods and "scrub" to the Jupiter River. Pine woods appear on the southern side of the river for a short distance, then "scrub" to about nine miles north of West Palm Beach, where there is a small area of pineland. After that "scrub" appears again and extends all the way to West Palm Beach. South of West Palm Beach there is "scrub" with patches of *Pinus caribaea* for about twelve miles and then pineland to two miles south of Boynton. After the pineland "scrub" extends to a short distance south of Pompono, where there are some hammocks and cabbage-trees and cypress swamps. Then the prairies, hammocks and cypress strands in the vicinity of Cypress Creek four or five miles north of Fort Lauderdale, pass into a similar country about the forks of Middle Creek where there is also some "scrub" in the pineland. Thence low pinelands with some cypress extend to Fort Lauderdale. The hammocks of New River give way to pinelands and these, about two miles south of the town, are bordered with wide marshes. At a point about twenty-two miles north of Miami is hammock, then pineland appears, but soon gives way to "scrub," which is interrupted with pineland, but at eighteen and a half miles it appears again and extends to near Hallandale, sometimes with a pure growth of *Pinus clausa*, at other times with *Pinus clausa* and *P. caribaea* growing together. From Hallandale to Miami there is mostly pineland, except along the intersecting creeks, which naturally are bordered by hammock.

The time of our visit to Florida was naturally the dullest

season of the year, as far as flowering plants were concerned. It was just between the end of the fall flowering season and the resurrection characteristic of spring. Of course, there were herbaceous plants in bloom nearly everywhere, either individually or in certain areas more than in others. However, nowhere were there shows of flowers as there are at other seasons of the year.

The flora of the Everglades is at the best limited and never conspicuously showy. That of the pinelands in spring and summer is copious and usually very brilliant. However, there is one general locality where the collector will find many plants in flower at any season of the year. It is the borderland where the pinelands and the Everglades meet. There one is sure to find plants to interest him. So, at a prairie-like area along the Tamiami Trail west of Miami on our last collecting excursion, we found a garden with scores of plants in full bloom. The kinds ranged from grasses to composites. Most of them were low, ranging from pipeworts on the one hand, an inch or two tall, to, on the other, an Indian-plantain, between two and three feet tall. The latter was the most striking plant in the collection, and with its glaucous, elongate, sharply toothed leaves and its flat-topped inflorescence of many pale heads, and also its large numbers, it stood out in strong contrast with all the accompanying vegetation.

Many genera were represented by a single species, some by more than one species. Several of the more conspicuous plants fell into genera by pairs; for example, there were two kinds of panic-grass (*Panicum*), two galingales (*Cyperus*), two spike-rushes (*Eleocharis*), two nut-rushes (*Rynchospora*), two blazing-stars (*Lacinaria*), two flea-banes (*Erigeron*), two goldenrods (*Solidago*), and two marsh-fleabanes (*Pluchea*).

Much of interest has been lost from the historic trails of Florida. An infinite interest yet remains.

JOHN K. SMALL

# THE PALM COLLECTION

During and after the recent reconstruction of the roof of the large palm greenhouse at Conservatory Range No. 1, New York Botanical Garden, the extensive collection of palms was rearranged. This collection has been brought together during the past twenty years, partly by gifts of fine plants from many friends of the institution, partly by specimens obtained in exchange with other gardens and partly by plants obtained by exploring expeditions and partly by plants grown from seeds; it now contains about 130 different species, represented by 530 individual plants, large and small and, except for a few small specimens in the propagating houses it is installed in houses 1, 13, 14, and 15 of Conservatory Range No. 1, near the Bronx Park Station of the Third Avenue Railroad. There are many noteworthy and perfect specimens.

The two tallest specimens are a feathery Cocos from Brazil, reaching a height of forty feet and a Corozo Palm (*Acrocomia*) from Porto Rico, its trunks a foot in diameter, entirely covered with black, sharp spines.

The most graceful one under the large dome is a rock date palm, each of its ten-foot leaves arching nearly to the ground. Two sturdy companions of this are a pair of *Phoenix reclinatus*, spreading their leaves for thirty feet or more from thick old trunks, which are now nearly three feet in diameter. A sugar palm of India, *Arenga saccherifera*, which is of economic importance there, will also be found under the big dome. Starting up the sides of this huge glass house are now many young climbing palms of the genus *Nunezharia*. These will be trained upwards. In the houses next the dome will be found numerous smaller specimens, many of them rare. Here may be seen the Wax Palm from Brazil, with waxy white under-surfaces of leaves; this palm will be one of the most striking in the collection in future years.

In House 13, the eastern secondary dome, are two notable groups. One is of our American Desert Palm, *Neo-Washingtonia robusta*, four magnificent plants from the cañons of Southern California; another of the Chinese Fan Palm, the leaves measuring five feet across. In this house also will be found the tallest palm of Porto Rico, the Plume Palm, which was brought to the Garden in 1906 by Dr. Britton and the late Professor J. F. Cowell.

# CONFERENCE NOTES FOR NOVEMBER AND DECEMBER

The November Conference of the Scientific Staff and Registered Students of the Garden was held in the museum building on the afternoon of November 2nd, 1921.

Two topics were represented, one by Dr. Arthur Hollick and one by Dr. F. J. Seaver, who have prepared the following abstracts of their discussion.

## "A Review of the Fossil Flora of the West Indies"

### By Dr. Arthur Hollick

Very little is known about the fossil flora of the West Indies. The complete bibliography of the subject consists of less than twenty titles. Some of these are mere incidental references to the occurrence of fossil plants, without descriptions or names; others are descriptions of silicified wood, of doubtful diagnostic value; others are descriptions of marine calcareous algae contained in limestones.

Antigua and Cuba have furnished most of the woody specimens; references to leaves and other remains of plants are to be found mostly in connection with descriptions of Santo Domingo and Trinidad; the algae are from Antigua, Anguilla, Saint Bartholomew, and Martinique. I am aware of only one article of a descriptive nature, with illustrations, based upon identifications of fossil leaves.[1]

In the Muesum of the New York Botanical Garden we have collections of well defined, identifiable leaves from three localities in Cuba, from three in Porto Rico, from three in Trinidad, and from one in Santo Domingo. Those from Cuba, Porto Rico, and Trinidad were all collected within the past six years. The collection from Santo Domingo, consisting of seven specimens only, was made by Wm. M. Gabb, in 1868, and was only recently brought to light while I was engaged in a search for all available material representing the West Indian fossil flora. The Trinidad specimens were collected, in part by Dr. N. L. Britton in 1920, and in part by Gilbert Van Ingen in 1921. The

[1] Berry, E. W.: Tertiary Fossil Plants from the Dominican Republic. U. S. Nat. Mus., Proc. **59**: 117–127, *pl. 21*. 1921.

Porto Rico specimens were collected by Bela Hubbard in 1915, incidental to the geological survey of the island under the joint auspices of the New York Academy of Sciences, the American Museum of Natural History, and the Insular Government of Porto Rico. The Cuban specimens were collected by Brothers Leon and Roca in 1918.

The total number of specimens in all the collections is about 200, of which about 50 are identifiable species or genera. Most of these have been figured and a number of provisional identifications have already been made. It is hoped that all identifications and descriptions will be completed in the near future.

The geologic age of all the collections is apparently Tertiary. The Porto Rican specimens are probably Eocene. The Trinidad and Santo Domingo specimens appear to be more recent—probably Miocene. The Cuban specimens are the most recent and may represent, at least in part, merely remains of the vegetation now in existence there, incrusted with calcareous tufa.

## "Preliminary Notes on Trinidad Fungi"

By Dr. F. J. Seaver

During the six weeks spent in Trinidad, six hundred and forty seven collections of fungi were obtained. In addition to these a small collection of slime moulds was made which collections were unnumbered, not knowing in what condition they would arrive. When divided up into exchange sets there will be more than two thousand specimens.

Trinidad is very rich in fungi in general, but very poor in certain groups such as the fleshy cup fungi and agarics. The cup fungi seemed not to be abundant even when the conditions of moisture and substratum were apparently most favorable. Whether this is a seasonal or general condition it is impossible to know from a single visit. A few large cup fungi were, however, obtained, among them *Peziza badia* which was found in abundance in an abandoned pit where clay is burned to be used for surfacing the roads.

The Pyrenomycetes, on the other hand, are abundant and many of them very different from the forms which occur in the North. Of the Hypocreales, a number of species of *Hypocrella* were collected. This genus is of interest for two reasons: In

the first place, it represents the perfect stage of the genus *Aschersonia* and several papers have recently been published on this phase of the question. In the next place both *Hypocrella* and *Aschersonia* are of interest because they occur as parasites on destructive insects, especially scale insects. Such fungi are of importance because of the possibility of using them as a means of controlling the insects on which they occur. A few insects are held in check by this means. A number of species of Hypocreales were collected which have not been determined and may be undescribed. Others are South American species not before represented in our collections.

A large number of wood fungi were obtained most of which have been determined by Dr. W. A. Murrill. A few are apparently South American, not occurring in the North and can be determined only by comparison with South American material.

Considerable attention was given to the collection of the rusts on account of the unusual opportunity of getting the hosts determined in the field by Dr. Britton, the determination of the hosts being one of the prerequisites for the successful naming of the species; also for the reason that no attempt has ever been made to enumerate the species occurring in Trinidad. One hundred and sixty collections were made, representing seventy one species, four of which are new, and several others rare. A list of the species will be published by Dr. J. C. Arthur in the January issue of Mycologia. At least five sets of the rusts will be made, one hundred and fifty of which have already been exchanged for an equal number of tropical rusts collected by Dr. E. W. D. Holway.

This report is entirely preliminary since many of the collections of ascomycetes have not yet been studied critically.

The December conference of the Scientific Staff and registered students of the Garden was held on the afternoon of December 7th.

Mrs. E. G. Britton gave an interesting discussion of her extended studies of the mosses of Cuba, Haiti, and Trinidad. Numerous specimens were exhibited, particularly of the genera of pleurocarpous mosses.

Among them were included type specimens of several new

species, including *Daltonia* and *Stenodictyon*. Further notes on the species of *Rhacopilopsis* from Trinidad, French Guiana and Africa were shown and it was stated that the variations were such as to scarcely be specifically distinct.

Dr. N. L. Britton exhibited a set of ferns and flowering plants collected by the distinguished Swedish botanist, Dr. Carl Skottsberg on the islands of Juan Fernandez, Mas-a-tierra and Mas-a-fuera. Dr. Skottsberg has now completed a survey of the vegetation, which he finds consists of about fifty species of Ferns and Fern-allies and a somewhat larger number of flowering plants. Dr. Britton made special mention of the genus *Robinsonia* which includes trees and shrubs of the Compositae. In the naming of the species from these islands the names Robinson and Crusoe are frequently used in commemoration of the shipwrecked sailor of Defoe's well-known narrative. The isolation of the islands together with their volcanic origin give special interest to the flora, which includes many species growing there only.

Dr. Skottsberg has also visited Easter island, which lies still farther to the West, for the purpose of special study of its vegetation.

A. B. STOUT.
*Secretary of the Conference.*

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## NOTES, NEWS AND COMMENT

Greatly needed repairs were made this fall on the central dome of Conservatory Range No. 1 and were successfully completed just before the cold weather started in. After some twenty years of exposure to the warm, moist atmosphere beneath, it was found necessary to replace all the wooden rafters and bars in which the glass is set and repaint the iron work of the entire lower dome. Much broken glass also had to be replaced. The work required the labors of some 12 or 15 men for a period of about seven weeks.

The commencement has been made this autumn in bringing together an extensive collection of Paeonias in the Horticultural Garden on land west of the principal plantations of Iris. Noteworthy gifts of plants for this purpose have been received from

Mrs. Edward Harding, being roots of fifty choice, recently developed varieties, which have been planted in a plot by themselves, and also seventy-five plants contributed by Mrs. Charles D. Dickey, planted in another plot. Mrs. Harding, who is a high authority on Paeonias, has given us valued advice as to location, soil and fertilizers, and through her interest the bonemeal fertilizer required was given by The American Agricultural Chemical Company.

About 500 biology pupils of Evander Childs High School visited the Garden with their teachers on December 6 and 7. Mr. Hastings gave a lecture on forestry, and considerable attention was devoted to the museum and greenhouse collections under the guidance of members of the staff.

Dr. L. O. Overholts, of the Pennsylvania State College, spent the latter half of December at the Garden, completing his study of *Pholiota*, an important genus of the fleshy fungi, for early publication in North American Flora.

The following visiting scientists have registered in the library during the autumn: Mr. D. S. Carpenter, Middletown Springs, Vt.; Miss Eloise Gerry, Madison, Wis.; Mr. L. J. Pessin, Agricultural College, Miss.; Prof. J. B. S. Norton, College Park, Md.; Prof. C. C. Glover, Ann Arbor, Mich.; Mr. John M. Arthur, Yonkers, N. Y.; Prof. W. W. Rowlee, Ithaca, N. Y.; Rev. J. P. Otis, Marshallton, Del.; Prof. Irving W. Bailey, Boston, Mass.; Dr. Ralph E. Cleland, Baltimore, Md.; Dr. Edgar T. Wherry, Mr. W. W. Eggleston, Dr. J. N. Rose, Mr. John W. Roberts, Mr. G. Hamilton Martin, Jr., Dr. Perley Spaulding, and Mr. Maurice Ricker, Washington, D. C.; Mr. A. A. Pearson, Treas. British Mycological Society; Mlle. Sophie Satin, Dresden, Germany, and Prof. N. T. Vavilov, Petrograd, Russia.

*Meteorology for November*: The total precipitation for the month was 4.60 inches. There were traces of snow on the 14th. The maximum temperatures recorded for each week were as follows: 63° on the 1st, 64° on the 7th, *70° on the 18th*, and 58° on the 22nd. The minimum temperatures were: 30° on the 6th, *28° on the 13th*, 32° on the 16th and *28° on the 26th*.

*Meteorology for December*: The total precipitation for the

month was 3.19 inches, of which 0.85 inches (8 and ½ inches by snow measurement) fell as snow. The maximum temperatures recorded for each week were as follows: *60° on the 1st*, 47° on the 10th and the 11th, 54° on the 18th, 45° on the 19th and 43° on the 27th. The minimum temperatures were: 23° on the 5th, 18° on the 9th, 13° on the 16th, *6° on the 22nd* and 7° on the 30th. The first ice of the autumn formed across the middle lake in the night following the 4th.

*Meteorology for the year 1921*: The total precipitation for the year at the New York Botanical Garden was 34.90 inches. This was distributed by months as follows: January, 2.39 inches (including 2 inches snow measurement): February, 3.23 (including 16 inches snow measurement); March, 2.22; April, 3.21; May, 2.62; June 3.02; July, 1.76; August, 4.73; September, 3.35; October, 0.58; November, 4.60 (including a trace of snow); December 3.19 (including 8 and ½ inches snow measurement). The total fall of snow for the year was 26 and ½ inches. The maximum temperature for the year was 98°, on the 22nd of June. The minimum was 4°, on the 19th of January. The first killing frost of the autumn was on the morning of the 26th of October, when a temperature of 29½° was recorded. The latest freezing temperature of the spring was on the morning of the 12th of April, when a temperature of 30° was recorded.

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## ACCESSIONS

84 specimens of fossil plants from Trinidad, West Indies. (Collected by Dr. N. L. Britton and Professor Gilbert van Ingen.)

34 specimens of flowering plants from Texas. (By exchange with Professor Albert Ruth.)

347 specimens of ferns from Haiti. (By exchange with the United States National Museum.)

150 specimens of fossil plants from Brazil. (By exchange with Professor J. C. Branner.)

1 photograph of the type specimen of *Pentstemon mensarum*. (By exchange with the United States National Museum.)

12 photographs of specimens of cactaceae. (Acquired from Mr. N. E. Brown.)

63 specimens of mosses from Haiti. (By exchange with the United States National Museum.)

6 specimens of *Rubus*, *Viburnum*, *Tilia*, and *Amelanchier* from the southern United States. (By exchange with Mr. W. W. Ashe.)

88 specimens of ferns from various localities. (By exchange with the United States National Museum.)

1 specimen of *Polygonum neglectum* from Staten Island, New York. (Given by Dr. N. L. Britton.)

22 specimens of cacti (2 photographs). (By exchange with the United States National Museum.)

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Dr. Robert Abbe,
Fritz Achelis,
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George F. Baker,
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Prof. Henry F. Osborn,
Chas. Lathrop Pack,
Henry Phipps,
F. R. Pierson,
James R. Pitcher,
Ira A. Place,
Hon. Anning S. Prall,
Charles F. Rand,
Ogden Mills Reid,
Edwin A. Richard,
Prof. H. M. Richards,
John D. Rockefeller,
William Rockefeller,
W. Emlen Roosevelt,
Prof. H. H. Rusby,
Dr. Reginald H. Sayre,
Mortimer L. Schiff,
Albert R. Shattuck,
Henry A. Siebrecht,
William Sloane,
Valentine P. Snyder,
James Speyer,
Frederick Strauss,
F. K. Sturgis,
B. B. Thayer,
Charles G. Thompson,
W. Boyce Thompson,
Dr. W. Gilman Thompson
Louis C. Tiffany,
Felix M. Warburg,
Paul M. Warburg,
Allen Wardwell,
H. H. Westinghouse,
Bronson Winthrop,
Grenville L. Winthrop.

## Members of the Women's Auxiliary

Mrs. George A. Armour,
Mrs. Robert Bacon,
Miss Elizabeth Billings,
Mrs. N. L. Britton,
Mrs. Charles D. Dickey,
Mrs. A. Barton Hepburn,
Mrs. Robert C. Hill,
Mrs. Walter Jennings,
Mrs. Delancey Kane,
Mrs. Hamilton F. Kean,
Mrs. Gustav E. Kissel,
Mrs. A. A. Low,
Mrs. V. Everit Macy,
Mrs. Henry Marquand,
Mrs. George W. Perkins,
Mrs. George D. Pratt,
Mrs. Harold I. Pratt,
Mrs. James Roosevelt,
Mrs. Benson B. Sloan,
Mrs. Theron G. Strong,
Mrs. Henry O. Taylor,
Mrs. W. G. Thompson,
Mrs. Cabot Ward.

## Honorary Members of the Women's Auxiliary

Mrs. E. Henry Harriman,
Mrs. John I. Kane,
Mrs. Jas. A. Scrymser,
Miss Olivia E. P. Stokes,
Mrs. F. K. Sturgis,
Mrs. F. F. Thompson.

# Provisions for Benefactors, Patrons, Fellows, Fellowship Members, Sustaining Members, Annual Members and Life Members

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## 1. Benefactors

The contribution of $25,000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a benefactor of the Garden.

## 2. Patrons

The contribution of $5000.00 or more to the funds of the Garden by gift or by bequest shall entitle the contributor to be a patron of the Garden.

## 3. Fellows for Life

The contribution of $1000.00 or more to the funds of the Garden at any one time shall entitle the contributor to be a fellow for life of the Garden.

## 4. Fellowship Members

Fellowship members pay $100.00 or more annually and become fellows for life when their payments aggregate $1000.00.

## 5. Sustaining Members

Sustaining members pay from $25.00 to $100.00 annually and become fellows for life when their payments aggregate $1000.00.

## 6. Annual Members

Annual members pay an annual fee of $10.00.

All members are entitled to the following privileges:

1. Tickets to all lectures given under the auspices of the Board of Managers.
2. Invitations to all exhibitions given under the auspices of the Board of Managers.
3. A copy of all handbooks published by the Garden.
4. A copy of all annual reports and Bulletins.
5. A copy of the monthly Journal.
6. Privileges of the Board Room.

## 7. Life Members

Annual members may become Life Members by the payment of a fee of $250.00.

## Information

Members are invited to ask any questions they desire to have answered on botanical or horticultural subjects. Docents will accompany any members through the grounds and buildings any week day, leaving Museum Building at 3 o'clock.

## Form of Bequest

**I hereby bequeath to the New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of.....**